THE

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ELECTRICAL REVIEW.

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LIGHTNING AND TREES.

THE prevalence of thunderstorms during the past fortnight, and the alarming number of fatalities caused by lightning, have drawn public attention to the danger of sheltering under trees to avoid the downpour which usually accompanies the fire of Heaven.

During the remarkable storm which visited South London on Sunday, 14th inst., no fewer than seven persons were killed on Wandsworth Common alone, four of the victims being little children. A Mr. West and his fiancée, together with a Mr. Betts and his daughter of 3½ years, were standing under a poplar tree, Betts holding an umbrella in one hand, while he held his child with the other, and all were knocked down and lost their lives, although West did not expire until he had been taken into the Hospital near by. A Mrs. Munday was wheeling a perambulator with a baby, but was not close to the tree trunk, and although she was knocked down, the child was uninjured.

A young chauffeur, who was standing under a tree within 20 yards of the spot where the other three children were playing, said the fatal flash also struck him. He was closely questioned by the Coroner with the object of ascertaining his sensations, and amongst other questions was the following :—

"Were you wearing rubber soles?—I had a pair of rubber heels on my shoes.

"Coroner: I daresay that saved you."

Our readers will, no doubt, appreciate at its proper worth the worthy Coroner's electrical knowledge!

The Wandsworth Common keeper was asked by the Coroner whether it was in his experience dangerous to stand under trees. He replied that it was not very dangerous if there was plenty of earth round the base of the tree and if persons did not stand too near the trunk. Personally, he often stood under trees, and had never been struck. He usually warned people about the danger of standing under trees.

The Coroner, in summing up, remarked that he did not know that one could learn any lessons in the case, but it was certainly significant that Mrs. Munday was not standing close to the trunk of the tree, but at some distance away, while by her side was a baby in a perambulator; the baby was not injured, but the woman was.

Practically day after day since this lamentable occurrence the newspapers have published instances of fatalities and injuries in various parts of England and abroad, and the lesson to be learnt is the very old lesson which should be instilled into the mind of every school boy and girl by every school teacher in the kingdom, that everybody, however small his instinct of self-preservation, should avoid the vicinity of trees during a thunderstorm and allow himself to be drenched on the road rather than offer his life as a sacrifice to the lightning, for, as M. Camille Flammarion, the astronomer, remarks, the oak's robust trunk, or that of the poplar, elegantly plumed with its graceful

foliage, may be the altar on which the sacrifices in honour of Jupiter are made. The lesson thus instilled into the youthful mind could in turn be imparted by the children to their parents who, in rural districts, are certainly as ignorant as their own offspring.

In our issue of last week, on page 1041, we published two tables showing the frequency with which different trees were struck, and we are now able to supplement these with others. M. Flammarion collected during recent years the following list of different kinds of trees, with the record of the number of times each species had been struck by lightning within a given period :—54 oaks, 24 poplars, 14 elms, 11 walnuts, 10 firs, 7 willows, 6 pines, 6 ashes, 6 beeches, 2 limes, 2 apples, 1 mountain ash, 1 mulberry, 1 alder, 1 laburnum, 1 acacia, 1 pseudo-acacia, 1 fig, 4 pears, 4 cherries, 4 chestnuts, 3 catalpas, 1 orange, 1 olive, 0 birch, 0 maple.

The following table gives data based on the number of trees of different species struck by lightning during a series of recent years in the forests of Lippe, in Germany :—

Species of trees.	Oak.	Fir.	Pine.	Beech.	Larch.	Ash.	Birch.
Total struck ...	159	59	20	21	7	5	4
Mean liability ...	57	39	5	1	—	—	—

In calculating the liability, allowance is made for the relative numbers of the different species, and the liability of beech to be struck is treated as unity throughout. Oaks, poplars and pear trees, and we may add from our own experience, elms, are especially liable to be struck, while beech is exceptionally safe.

Height incontestably accounts for a great deal. There is but little doubt that, in the case of a clump of trees standing in the middle of a plain, lightning will, in the majority of cases, select the tallest, although this is not an absolute rule. The qualities of trees as conductors, the degree of moisture in the soil in which they stand, the character of their foliage and of their roots—all are important factors.

Numerous experiments made with the view of ascertaining the resistance offered to the electric spark by, say, pieces of beech and oak, exposed lengthways to the spark of a Holtz machine have shown that oak was pierced after one or two revolutions of the machine, whereas beech required a dozen or twenty, and black poplar and willow were penetrated by a few revolutions. There are innumerable examples of the imprudence of taking shelter from rain under trees during a thunderstorm, but if we have to take such refuge, give us a beech tree for preference, with the birch a close second.

In these days, indeed, the beech is believed to go unscathed, although we have quoted examples of its occasionally being struck, and in the State of Tennessee, in the United States, the opinion is so deeply rooted, that beech tree plantations are often resorted to as a refuge in times of storm, although, as we have shown, it would be a mistake to trust them absolutely.

Workers in the fields, too, have often been warned, but apparently to no purpose, of the dangers to which they expose themselves by carrying their implements with the points in the air. Carrying forks over their shoulders, putting scythes on carts with their points in the air have caused many deaths, and the casualties caused by open umbrellas are numerous and well authenticated.

Finally, to close this all too brief article—for one could write pages on this fascinating subject—we would say that, without allowing one's self to get lightning on the brain, certain precautions during a storm should never be forgotten :—

First and foremost, do not get under a tree, but if you choose to take the risk be careful to select the shortest amongst a clump; but *in any case stand well away from the trunk*. Do not run in a storm, for movements of the air have the effect of preparing an excellent route for lightning. Always close doors and windows in a house to avoid a draught, and keep well into the middle of the room. This reference to the house is mentioned as it concerns the number of people who are annually killed by lightning. The figures are largely influenced by the fact that persons employed indoors have much less chance of being struck by lightning than those engaged out of doors. As emphasising this fact, data obtained between 1852 and 1880 go to show that only 104 women were killed by lightning, as against 442 men.

We trust that the day is not far distant when a careful and systematic study will be carried out each year, preferably in the summer, of the caprices and vagaries of thunder and lightning.

Technical Training.

THE training of the rising generation is a subject of infinite complexity, resulting from the complicated conditions of modern civilisation, which call for an endless variety of courses of instruction, ranging from the elementary steps common to all classes, to the highly-developed curricula of the Universities and Technical Colleges. Between these wide limits, unfortunately, there are many gaps in our educational system, and nowhere is this more manifest than in the stage between the elementary schools and the colleges. The unskilled workman and the trained superintendent are well provided for, but, except in certain industries, little provision has been made for the skilled artisan.

The apprenticeship system, which was formerly relied upon wholly to meet the need, is quite inadequate to supply the wants of many trades, and the scientific teaching of the colleges is usually framed upon too broad a basis to take its place. In theory, the teaching of fundamental principles, and, above all, instruction in the art of thinking, should cover all requirements, but in practice insuperable difficulties are met with. The time available is limited, and many a youth who has the makings of a first-class artisan is, nevertheless, temperamentally unfitted to profit by the intellectual feast spread out before him.

The letter from Mr. R. W. Paul, which appears in our "Correspondence" columns to-day, and which, we understand, represents also the views of many of his colleagues in the instrument-making industry, draws attention to a specific instance in which the need of a trade school is clamant, and we commend the subject to the notice of the authorities who are concerned with the provision of facilities for the training of artisans, in the hope that steps may be taken towards remedying the deficiency.

Lead.

THE past few weeks have seen a renewal of the rather tight conditions which for months have been a recurring feature in the lead market, and by means of which the bears have been forced to pay for their temerity in attacking the article on the strength of the assumption that the position as regards forward deliveries was rapidly becoming permanently relieved. All such anticipations and theories have once again been doomed to disillusionment, the early part of June again witnessing a period of considerable strength and a very pronounced degree of scarcity as regards prompt and early delivery metal. With the price at £19 15s. and thereabouts, the temptation to American holders to sell metal for near shipment proved irresistible, and some considerable quantities were thrown upon the market, the buyers being not only dealers in London, but dealers and consumers in the provinces. Probably not less than 1,500 tons of American lead was thus disposed of last week, and and it is quite likely that the total amount marketed in this way runs into considerably larger figures, but, naturally, it is impossible to trace transactions when they are scattered all over the country. There is still a considerable premium on early lead, too big a premium for the position of the market to be regarded as thoroughly satisfactory, and if the price keeps up in this way the possibility of further considerable sales of American metal must be kept well to the fore. The big premium referred to is really the least satisfactory feature in the market, for it betrays an uncertain position, and inevitably leads to the throwing out of suggestions that the position is to a certain extent of a manipulated character. With good quantities of metal now afloat, however, it is just within the bounds of possibility

that there may be some relaxing of the tightness for a time. Certainly the amount lately sold is quite enough to assist the market to an easier frame of mind, though this is not to say that there may not be a renewed squeeze as June contracts begin to mature. Compared with all other metals, lead certainly stands at an unconscionably high price, but the mere fact that this is so is not sufficient to bring about a reduction, which must rest upon different circumstances.

The statistics of the lead trade, issued by Mr. Julius Matton, are really remarkable. The exports from Spain for the first three months of the year showed a reduction of over 9,000 tons, but this deficit was made up later on, and for the five months the Spanish returns indicated an excess, compared with last year, of 4,500 tons. There was an almost similar increase from Australia. The total imports of lead into the United Kingdom for the five months showed an increase against last year of 3,200 tons, while the exports were 1,500 tons less, hence there was an excess in the quantity available for consumption of 4,700 tons. Yet the market has for months past been in a condition of insipient squeeze, a condition which seems likely to recur indefinitely, and which to a certain extent must be attributed to the Mexican position. It is little short of remarkable that the world's market should not have felt the Mexican affair more severely than it has done. Notwithstanding the cutting off of a large part of the Mexican output, the United States, which draws largely upon Mexico for its raw smelting material, has been able to ship lead freely abroad, having in the first four months of the year dispatched only about 1,000 tons less than last year—13,000 tons. Any restoration of comfortable industrial conditions in Mexico would have a rapid effect upon the world's lead market.

New Zealand Trade.

Mr. W. G. Wickham, H.M. Trade Commissioner for New Zealand, has been spending several months in London and the provinces, during which period he has been placing himself at the disposal of British firms to give information in response to inquiries. He was kind enough to give us a quarter of an hour of the last of his crowded days for a brief conversation on the position of British electrical trade in New Zealand, at the Board of Trade Commercial Intelligence Department in London. There is really no material alteration in the position of affairs since our last reference to the subject. Our readers are already aware that several hydro-electric installations of some importance are being carried out, especially that at Lake Coleridge, and there has been considerable talk regarding a proposed electrification of the tunnel railway from Littleton to Christchurch, through which heavy traffic has to pass. In regard to installation work in New Zealand, this is almost entirely carried out through private contractors. Continental competition has been successful recently in connection with the supply of insulated cable for telephonic purposes, and for house installation work cheap and inferior wiring, not of British manufacture, is found in use. As most of the structures are built of wood, it is essential that installation work should be made as safe as possible, but there appears to be a need for better regulation in this respect by the authorities. For Government purposes a stringent test is imposed in such matters, and it seems only reasonable that in other installation work public control should not be wanting. A weakness in our dealing with the New Zealand market is the unwillingness of our manufacturers to agree to the testing of material on the spot. This criticism has been offered regarding our relation with the Australian market. It is considered most important that an agent of standing and good remuneration should be engaged in whom the Home manufacturer has complete confidence, so that he can be equal to carrying full responsibility on behalf of the manufacturer for any such tests that authorities may require machinery and other goods to stand. On the whole, it may be said that while our New Zealand kith and kin are not averse to American manufactures, they have strong predilections in favour of British goods, if price and quality are right.

ELECTRIC LIGHT AND POWER REGULATIONS IN THE ROUMANIAN OILFIELDS.

From time to time, for some years past, there have occurred serious fires and explosions in many of the Roumanian oilfields, involving not only great damage to property but also loss of life on more than one occasion, and the Roumanian mining authorities have had reasonable ground to suspect that faulty electrical work or carelessness in the use of electric light and power has been responisble for some of these terrible accidents, so far as can be ascertained from subsequent investigation.

Whether any such defects have really been the proximate cause or not, one result has been at any rate the putting into force of more stringent rules and regulations by the authorities in regard to the use of electricity on the oilfields. Indeed, so alarmed were those officials in charge of the industry that conditions verging on the impossible were last year promulgated as binding on all the oil enterprises, and a considerable outcry followed from the drilling companies who showed at once that they could not possibly comply with these rules, however much they might be willing to do so.

For instance, a ministerial decision laid down the definite rule that for power purposes on the oilfields no electric motors, except those of the short circuit alternating type, should be employed, owing to the possible danger of sparks from the collectors of the ordinary three-phase motors setting fire to any gas emanating from the wells, and penetrating the motor-houses.

It had already been insisted upon that all electric motors and transformers should be installed in brick-built and iron-roofed houses or sheds under lock and key, and to this wise precaution no one could have made or did make any objection.

As for the type of motor, however, the new decision of the authorities simply led to a deadlock; no new wells could be authorised; none already authorised could be drilled; and at many already commenced, the work had to be stopped. While in theory the short circuited type might give freedom from sparks, it is obviously not a suitable motor for the varying speeds and powers required in drilling, and after most urgent representations from the various companies concerned, the whole question of electric energy in use on the oilfields was gone into by an official commission, the results being embodied in a series of regulations which are summarised in the following paragraphs, representing the latest ideas upon the question from the Roumanian Government's standpoint, though to our stricter notions of safety measures, they still allow too many loopholes for bad workmanship and faulty material.

No generating plants—it is insisted—for any form of current at any pressure, and no transformer plants involving a tension above 1,000 volts, shall be installed nearer to an oilfield than the regulation minimum distance already prescribed for boiler-houses or blacksmiths shops. Exceptions are only allowed for existing transformer plants on fields where the oil-gas is piped off from the wells, and where there are no flowing wells. These transformer stations or plants must have no free contacts which might produce sparks, and must be fitted with oil switches, the transformers being also immersed in oil.

Any generating or transforming plant must be installed in a building of masonry, metal or other incombustible material, and be kept under lock and key, accessible only by those in responsible charge.

Overhead wires carrying current at a tension above 1,000 volts between any two conductors [Note: The public supply of electricity on the chief oilfields of Roumania is at a working pressure of 500 volts alternating three-phase, with a periodicity of 50 cycles.] must not be installed nearer to an oilfield than the prescribed distance for boilers and forges.

D

No overhead wire may be less than 16 sq. millimetres cross section. The minimum distance between overhead conductors must be 60 cm. (23.6 inches), and they must not come within 8 metres (26 ft. 3 in.) of the ground. The poles carrying overhead conductors are to be of metal, reinforced concrete, or wood, of dimensions suitable for the weight to be carried or the tension supported, and must be set not more than 30 metres apart. Insulators must be suitable for the working pressure.

No switches or fuses must be fixed on the overhead wire poles, except those of the high tension type under oil, intended to isolate the well in case of accident.

Lightning arresters capable of producing sparks (as, for instance, those of the horn type) are forbidden on the field itself.

The supply wires must be installed in such a manner that in case of a fire at any well, this well may at once be cut off from the supply by oil switches.

Wires or cables entering into the derrick buildings, and in all buildings on the field itself in the danger zone, must be insulated with rubber as far as the nearest pole of the overhead supply, and inside the building must be run in steel tubes. Flexible wires or connections, and free insulated wires on insulators, are forbidden. Similarly all lighting circuits using continuous current must be run in steel tubes with proper screwed hermetic joints and tee-pieces..

Single pole switches and fuses must no longer be used. If supply mains are brought on to a field, a single network must be employed for power and lighting, and a single circuit introduced into each derrick for the same purpose, but separate main switches and fuses are required in each derrick for lighting and for power, and are to be fixed in the motor-house under control solely of the person in charge of the motor.

For lighting the surface roads and open spaces between wells, special transformers may be installed on the overhead wire-posts, but they must fulfil the conditions already laid down.

Telegraph, telephone, or signal wires may be run on the overhead wire-posts, but in all cases below the high tension wires, and they must not produce sparks or incur any danger from possible contact with the latter.

Arc lamps and open-flame lamps are forbidden to be used on the fields; incandescent lamps only may be employed, and must be protected by hermetic glass globes and wire guards outside. The maximum lighting pressure is to be 110 volts, but any existing installation may continue working at pressures up to 220 volts if satisfactorily installed. Portable hand lamps with movable contacts are forbidden, as are also continuous current motors.

The motors to be used on the fields must be of the short-circuited induction type; other induction motors may be employed, for example, those with moving contacts or with rings and collectors for starting and speed regulation through resistances, but in all such cases the motors must be absolutely and totally enclosed, the parts where sparking might arise being covered over hermetically, and thereafter locked so that no spark may possibly pass in the open. The electrician in charge is to be responsible for the key. In gas-free fields, or where the gas is piped away completely, other types of alternating motors may continue to be employed by consent of the Council of Mines, where such are now in use.

Speed regulators must be oil-immersed, and all resistances must be capable of working satisfactorily below a temperature of 150° C. when the atmospheric temperature is 35° C. Fuses or other means must be employed to break the circuit when the current is greater than corresponds to the temperature above named.

Resistances must be of such dimensions that they shall function properly at any point of contact in the regulator.

Proper certificates must be shown before motors or resistances are installed; those for motors must give the results of tests in gaseous atmospheres, and those for resistances must show their maximum working temperature and conditions during tests.

For lighting circuits up to 10 amperes the fuses need not be under oil, but their construction must be such as to prevent them being moved while the switch is closed, and also to avoid any danger of working loose by vibration.

Similarly the switch under these conditions need not be under oil if it is closed hermetically and without danger of explosion.

All connections between switch-boards, motors and other apparatus must be of insulated cable, armoured or mechanically protected.

Installations must be carried by none but specially authorised firms or companies, under the control and responsibility of engineers certified by the Direction of Mines.

Every drilling company must have in each field where it operates at least one duly certified electrician authorised by the Direction of Mines. Individuals will be so certified who possess the diploma of suitable schools or colleges, or who have for at least two years worked in responsible positions on the fields.

The latter must undergo an examination by a commission of specialists appointed by the Direction of Mines.

No installation material, plant or apparatus must be employed unless it has had the approval of the Ministry of Commerce and Industry.

Samples and models of all such materials, etc., must be deposited at the Ministry for permanent reference, and if any object does not fulfil its aim, the Minister will authorise a type to be used.

An installation though finished and put into service may be shut down by any delegate of the Minister if he is satisfied that the work has not been carried out in accordance with the regulations.

The State confines itself to announcing these changes and transformations, the exploiting companies must carry them out, and every demand to the State by the exploiting companies or individuals for authority to carry on work must be preceded by the necessary information called for in regard to material, etc., used, and certificates required in regard to motors and resistances.

For effecting the changes in type of motor to be used, a delay of one year is given, for the proper appliances, materials and apparatus otherwise to be used; samples and models must be submitted within three months for approval, and they are to be installed within two months of approbation. Shorter periods down to eight days are given for complying with other parts of these regulations, and any person or persons contravening the regulations will be liable to punishment under the Mining Laws, all their exploitation work being at the same time stopped.

L. & N.W. Switchgear.—With reference to the notice on page 1028 of our last issue regarding the London and North-Western Railway switchgear contract, as this article may give the impression that the British Westinghouse Co. has secured the order for the whole of the low-tension switchgear panels for the 11 sub-stations mentioned, we are asked to state that Messrs. Whipp & Bourne, of Castleton, have the order for the whole of the switchgear controlling the automatic reversible boosters of "Entz" type which are being supplied by Messrs. Bruce Peebles and Co. The circuit breakers on these panels are of Messrs. Whipp & Bourne's manufacture, and of their standard type. None of the instruments on these panels will be of Westinghouse manufacture, the indicating and recording instruments being by Messrs. Everett, Edgcumbe & Co., and the ampere-hour meters and watt-hour meters of combined Chamberlain & Hookham and Everett, Edgcumbe & Co.'s manufacture. The D.C. panels that are being supplied by Messrs. Whipp & Bourne form, we understand, a substantial percentage of the D.C. switchboards.

CORRESPONDENCE.

Letters received by us after 5 P.M. on Tuesday cannot appear until the following week. Correspondents should forward their communications at the earliest possible moment. No letter can be published unless we have the writer's name and address in our possession.

The Training of the Instrument Maker.

In the advancement of any branch of science, and particularly that of electricity, the art of scientific instrument making and the training of the instrument maker are important factors. Considerable progress has been made during the past decade in the design and accuracy of electrical standard and testing instruments, but the all-round skilled English craftsman of earlier days is becoming more and more rare, while no organised effort is being made to train men of this type, and the progress of the trade of this country is being seriously handicapped on this account. Firms which manufacture a few special instruments in quantity may not need large numbers of well-trained and skilful workmen, since by subdivision of the work and increased supervision and inspection, combined with thorough organisation, it is possible to substitute machine operators and assemblers for instrument makers. Nevertheless, there is an ever-widening demand for high-class instruments, which, in many cases, must be made throughout by individual workers able to grasp the requirements and to turn their hands to a great variety of operations. In such work a poor standard of attainment on the part of the worker involves constant watchfulness and strain on the part of the management if endless mistakes and defects, and consequent loss, are to be avoided.

Recalling, for a moment, the conditions of the trade 25 years ago, one found a number of excellent workmen recruited from the ranks of clock, optical and philosophical instrument makers, able to construct a well-finished piece of apparatus from a rough sketch or pattern, and taking no little pride in their personal skill and in the result of their work. The Post Office and submarine cable companies, then the principal users of measuring instruments, enforced a good standard of workmanship, and the variety of testing instruments was practically limited to their requirements, chiefly consisting of resistance boxes, tangent and astatic galvanometers, Kelvin galvanometers, testing keys, and so forth. The work was usually carried on as a department of a firm or concern which manufactured other electrical apparatus or other forms of scientific instruments. Almost every worker had served his time and was somewhat of a personality; as far as possible each man had his pet job, which came to him as a matter of course; his lathe and hand-tools were regarded as personal to him, and milling and drilling machines were not too common, some of the old stagers still using the fiddle-bow drill.

Under such conditions were made the earlier forms of ammeters, voltmeters, supply meters, and similar apparatus, which soon afterwards formed separate trades working under entirely different conditions; the comparative simplicity of construction, the quantities dealt with, and the necessity for economical production led to minute subdivision of the work and organisation on manufacturing lines; youths were able to enter such shops and earn good money almost from the commencement, while retaining their ignorance of electrical principles and of the craft as a whole.

At the present time, it is no uncommon experience when questioning an applicant for work to find that he is unable to set a slide gauge or micrometer to an odd size, such as 19/64 in., or, if he professes a knowledge of electricity, to find that he is unable to draw a Wheatstone bridge diagram, or to describe the principle on which a moving-coil galvanometer works.

Close inquiry and observation have forced me to the conclusion that technical classes have done little or nothing for the instrument maker. For over 20 years I have trained apprentices in my works with fair success, and have allowed each lad to leave early for the purpose of attending evening classes, which he is expected to do regularly. The courses available comprise elementary electricity and magnetism and elementary electrical engineering, with laboratory work. At one or two of the institutes a workshop is available, but, from a practical point of view, this offers small advantage to the apprentice on account of the shortness of the lessons. The apprentice sees no direct application of the lecture and laboratory work to his daily task, nor, so far as I am aware, is any attempt made by the teachers to keep in touch with the conditions and requirements of the instrument trade, perhaps because the classes consist chiefly of a mass of students from other branches of the electrical industry. During these 20 years I have had the honour of meeting many technical teachers, but none has ever asked me for information on the needs of the young instrument-maker. To the principal of one of our best technical colleges I once said: "What we need is craftsmen;" he only repeated that unfamiliar word in astonishment.

On eliciting the views of half a dozen of my works staff who have served their apprenticeship here, as well as those of about a dozen of my apprentices, I find that they are unanimous in the statement that their class work appears to have nothing to do with their work in the factory. As one of the lads said: "You don't gain much all round, because the main thing is they do not apply to the trade." On account of the ambitious scope of the classes and the attempt to make them suitable for lads in all branches of the electrical trade, these apprentices have, almost without exception, felt it necessary to go over each course two or three times because "he could not get hold of it the first year and could not do the calculations, and lots of things are gone before the next year." The laboratory work is regarded as interesting, but "it does not seem to bear in any way on the work in the factory, and the instrument is never explained from the point of view of the maker." The classes are in many cases overcrowded, and, through lack of equipment, it is often impossible to arrange the laboratory work to follow up the preceding lecture; and at most institutes it is difficult for the student to get individual attention. The latter defect has also occurred with the comparatively small percentage of apprentices who have taken classes in drawing, the importance of which the average apprentice entirely fails to realise. Those who have attended drawing classes have, I find, been occupied in copying from blue prints and taking out details, but the instruction appears to have been entirely divorced from any consideration of design, even in regard to minor details such as would be within the capacity of the student.

The London apprentice who attends evening classes generally spends from two to three hours in travelling, and reaches home very late. The omission of a few attendances puts him entirely out of touch with the course which, as one of them says, "always goes much too fast for us." No wonder that the average lad becomes discouraged with the difficulty and remoteness from his trade life of the class work, and abandons the classes entirely before the end of the session.

In the opinion of a successful ex-apprentice, who has witnessed the career of about 40 apprentices in the shops, "None of them have gained anything by their classes except those who went into the test-room permanently."

There is no trade offering greater scope for an intelligent lad to develop his faculties and to acquire such skill as will ensure him a good and secure livelihood. There are plenty of lads who, on leaving school, are keen to produce something with their hands, and who might become creditable workmen under a proper system of training. The foreman has neither time nor opportunity to teach such a lad shop arithmetic, the properties of materials, the elementary mechanics and physics necessary in shop work, or, in fact, such information as could be imparted rapidly and systematically in a trade school, but which the apprentice takes about two years to pick up in a casual and inefficient manner.

In a school devoted entirely to one trade lads could obtain that companionship in work, common interest, and freedom to discuss their difficulties, and to help each other, which I find entirely lacking in the present mixed classes. To use the expression of one of them: "A number of fellows in the same trade would work together with more interest."

The time has at last arrived when the London County Council, having investigated the magnificent trade schools of France and Germany, and in particular the compulsory trade schools in Munich, is considering the establishment of additional preparatory trade schools in London. There would be many advantages in the association of a trade

school with an instrument factory, but the individual employer would scarcely feel justified in assuming the whole expense, since the benefit would be common to the community, although he might partly be recompensed by the increased efficiency and more rapid progress of his apprentices. Moreover, many shops do not take indentured apprentices, and would have no means of ensuring the continued services of the lads. Nevertheless, I believe that a joint representation by firms conversant with the necessities of the trade would receive consideration on the part of the educational authorities, and that such a school could be established without undue delay. Personally, I am of opinion that one or two years' preliminary instruction in trade drawing and arithmetic, elementary physics, mechanics and electrotechnics, with some simple laboratory work during the morning, and systematic instruction under a skilled workman during the afternoons, would enable a lad of, say, 16 years of age, to enter the shop under far better conditions than at present.

I believe it to be essential for the success of such a school that the trade, employers and employed, should have a voice in the management, and that there should be a frequent interchange of ideas between the employers and the teachers. Continental experience has shown the advantage of dividing the instruction between a trained teacher and a trained workman, and, that course being adopted, there should be no difficulty in obtaining suitable instructors. On account of the distance apart in London of the various instrument factories, one school would not conveniently serve all the lads, but a start might be made with a single school situated conveniently for two or three factories, and would be none the worse for starting on a small scale.

I solicit the views of firms who would join in bringing the matter to the notice of the authorities, and who would give information and advice on the subject of trade schools for scientific instrument makers.

Robt. W. Paul.

London, N., *June 17th*, 1914.

"Transactions": Standardisation of Size.

Is it not possible for the Institutions of Civil, Mechanical, Electrical and Gas Engineers, the Royal Institution of British Architects, &c., to agree mutually on, and to recommend officially to the other technical institutions and societies, a standard size of paper for printing the "Transactions?"

Such an arrangement would be of inestimable benefit to the man who methodically files valuable information from many sources, and also to the engineer who is a member of two or more institutions.

The writer suggests 9 in. × 7½ in., which is the standard size of the well-known Walker's Loose-Leaf Note-Book.

Ronald Grierson.

London, W., *June 18th*, 1914.

The Institution and the Electrical Industry.

The letters which have recently appeared in your columns on the above subject indicate that considerable dissatisfaction exists as to the relationship now existing between the Institution and the electrical industry; and, as has been pointed out by more than one writer, it is for the members to see that an alteration in constitution and policy should be made, if, indeed, such alteration be desirable and beneficial. To paraphrase a pronouncement now about 1900 years old, the Institution exists for the benefit of the members, and not members for the benefit of the Institution.

But how can members effectively voice their discontent or suggest remedies for improvement?

The best means would appear to be through the local centres, and a case in point is the recent action of the Dublin Local Section, as reported in your issue of the 12th inst., and commented upon in your leading article of that date.

But is it likely that the Council of the Institution would act upon a suggestion from one local centre? I think not. What is required is joint action of all the local centres. And this brings me back to a matter I advocated in your columns some years ago, viz., the formation of a London Local Section, because in any combined action which the local centres might take, the London members who form probably a majority of the whole membership would be unrepresented.

There are other strong reasons which may be urged in favour of a London Local Section. These I have referred to before, but the ability to act in combination with provincial local sections is perhaps now the strongest. If all the local sections were unanimous upon any proposed course of action in the interests of the industry generally, they could, in the event of the General Council being unfavourable, combine to form a new federated association whose constitution would permit it to carry out an active instead of a passive policy.

Frank Broadbent.

London, E.C., *June 16th*, 1914.

There must be many members of the I.E.E. who have but the vaguest notion of the events resulting in the dissolution of the Industrial Committee, and of the real issue between that Committee and the Council.

The last Council report, the speeches at the general meeting, and the various references in the electrical Press, all fail to enlighten the rank and file to any material extent, though they indicate some strength of feeling.

If the late members of the Industrial Committee consider the matter to be of so much importance to the electrical profession and industry as their utterances indicate, surely it is desirable to get the formal opinion of the members as a body on their proposals, for the guidance of the Council, and of everyone concerned.

The constitutional method open to them is that of requisitioning a special meeting to discuss a substantive proposition, and the present time, between the sessions, and before the new President and Members of Council assume their duties, is opportune.

Before such meeting, it is desirable that the Council and the late Committee should jointly issue an agreed statement of the events which resulted in the dissolution of the Industrial Committee, that members may have an authoritative foundation for their judgment.

I write in the interests of the great majority of members, who have not taken sides, who do not know what is really at issue, but feel that it may be of great importance to the Institution itself, and to all interested in electrical work and progress; and that they are entitled both to full information, and to an opportunity of expressing a considered opinion.

Henry M. Sayers.

London, S.W., *June 22nd*, 1914.

[On the written requisition of 10 Corporate Members or Associates, the Council must call a special general meeting. —Eds. Elec. Rev.]

OPERATING EXPERIENCES ON THE LOETSCHBERG RAILWAY.

A recent issue of our American contemporary, the *Electric Railway Journal*, contained some particulars, derived from Swiss engineering sources, of the operating conditions of this railway. In the open the line construction conforms with standard single-phase practice, but a special construction has been adopted in the tunnel, where the catenary is of duplex wire with a 6-mm. diameter steel core and a coating of 1·25 mm. copper. The trolley wire is 6·7 m. above the rail at stations and 4·8 m. in the tunnels. The double insulators and trolley wire in the tunnel are supported at distances of 22 to 28 m.

Three telegraph and three telephone lines and a signal line are installed along the railway right-of-way, when underground, in paper-covered air-insulated cables, and elsewhere on wooden poles, the wires being transposed every fifth pole to minimise induction.

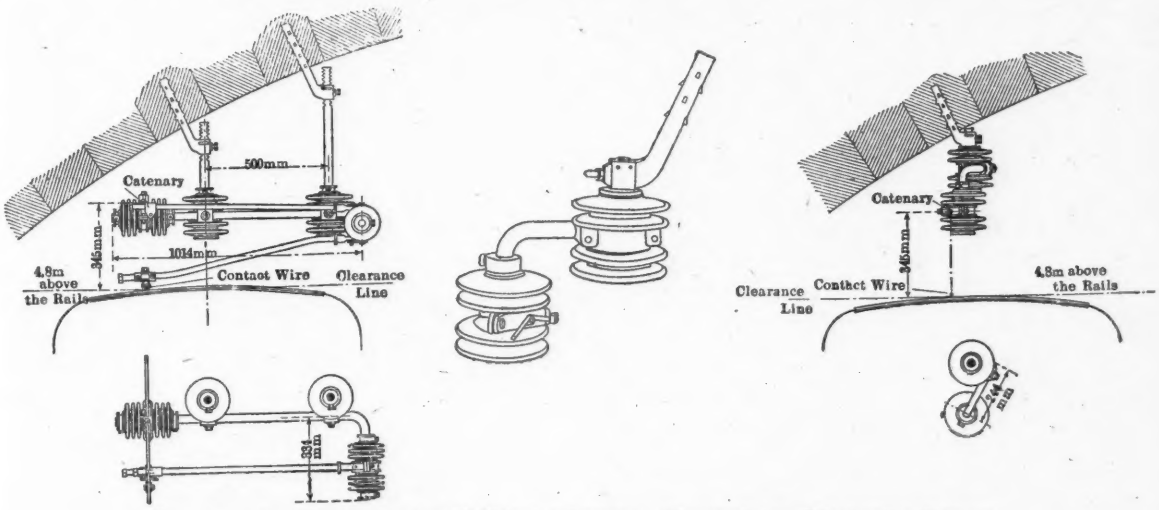
The tunnel telephones are operated from a central battery, and their receivers are equipped with signal sirens. Louder sirens give warning of the approach of trains, and are operated from small transformers of high periodicity. All these lines have operated satisfactorily, and clear speech is obtained over the telephone, despite the long cable used with numerous parallel cables and no Pupin coils.

Fuses are used where the cables pass aerial lines, and these have blown a number of times, but this has not caused trouble, as they can be easily replaced.

On the trial trips the locomotives met all the conditions for which they were designed, but they were not operated to full capacity in actual service, partly for the sake of caution and partly because a few mechanical and electrical details of the apparatus were found incapable of carrying the maximum loads.

The locomotive transformers gave trouble from static discharges, both between the individual turns and between the apparatus and the ground. As these very places had been insulated with particular care, the fault is held to be due to extraordinarily high voltages generated in some unknown manner. The latter may be caused by lightning disturbances, since the trouble decreased on the approach of winter. It is possible, however, that the trouble is due to high-tension discharges at the line insulators. To prevent a repetition of these troubles, the insulation at the entrance turns of the load transformers has been increased appreciably. It is considered remarkable that the 12 cases of disturbance did not occur during lightning storms or high-tension line disturbances, but, nevertheless, it is believed that there may be some connection between these phenomena.

The overhead construction, excepting for initial troubles, has given satisfaction. The drop in voltage is in accordance with theory, which is regarded as important, as the most favourably situated power station is 31 miles from the end of the line, and the long tunnel prohibited super-voltage transmission lines. The tunnel insulators caused the greatest difficulties. In the open no high-voltage discharges took place, but in the tunnel "spillover" discharges, commonly across both insulators, were quite numerous.



VIEWS SHOWING DETAILS OF THE 15,000-VOLT OVERHEAD CONSTRUCTION, LÖTSCHBERG RAILWAY.

Several discharges from the cover of the insulator to the pin were also observed. At first these troubles were ascribed to defects in the insulators, and this may have been true in some instances, but it was necessary to seek other causes when the short-circuits continued. It was then found that the localities most subject to this trouble were those where the moisture on the tunnel roof was sufficient to form drops of water, which fell on the insulators. In time this water built up a conducting path for discharges. It was also found that some damp insulators were scarred by particles of stone which had been blown against them with great velocity through the action of trains passing at high speed. To correct this trouble, the roof near the insulators has been waterproofed with lead wool and cement, and copper shields have been placed over the insulators. These changes were made without interfering with operation. The line inspectors now clear the insulators of dust at regular intervals, for even the precautions mentioned do not prevent the atmospheric conditions in the tunnel from vaporising the insulators to some degree.

In view of the great length (9 miles) of the tunnel and the fact that insulators are installed at 3,500 places, it is not remarkable that a very small percentage of them should have caused trouble. As the remedies have succeeded, it is believed that even very long tunnel sections with unfavourable moisture conditions may be operated safely at 15,000 volts.

Cables for Victorian Railways.—The BRITISH INSULATED & HELSBY CABLES, LTD., have secured the contract for the supply of the extra-high-tension feeder cables required in connection with the electrification of the Melbourne Suburban Railways. This is understood to be the largest contract for power cables ever placed, and it includes 73 miles ·15 sq. in., 44 miles ·1 sq. in., and 21 miles ·05 sq. in. 20,000-volt 3-core split concentric cables. This company has also received the contract for the supply of the overhead equipment of the same railway. The cables will be laid and the overhead equipment erected under the supervision of the company's staff. The combined value of the two contracts approximates £600,000.

ELECTRICAL FEATURES OF THE ANGLO-AMERICAN EXHIBITION.

THE Anglo-American Exposition now open at the White City, Shepherds Bush, W., presents a number of features of electrical interest though, with the exception of the Metropolitan railway signalling exhibit, these are to be found only in the permanent equipment of the buildings, grounds and side-shows. Current for all purposes is taken from two independent supply systems through four sub-stations, located approximately at the four corners of the exhibition grounds. Three-phase current at 5,000 volts, 50 cycles, is taken from the Notting Hill and Kensington Co.'s mains and single-phase current at 2,300 volts, 50 cycles, from the Hammersmith Council's Fulham Palace Road station. Three 0.25 sq. in. concentric cables from the Hammersmith system and three 0.125 sq. in. three-core cables from the Notting Hill system are carried into the main sub-station at Wood Lane, whence single and three-phase cables run to the other sub-stations in the grounds. Three 200-KW. single-phase and three 200-KW. three-phase Berry transformers at Wood Lane; and three 200-KW. single-phase and two 250 KW. three-phase transformers in the machinery hall sub-station provide a 440/220 volts three-wire single-phase supply and 220 volts per phase in a three-phase star system. For the supply of direct current there are installed a 150 KW. G.E.C. motor generator (single-phase slip-ring induction motor driving 500 volt. interpole dynamo) and two 400 KW. Bruce Peebles motor converters. The lamps in each building being staggered on single and three-phase services taken from separate switchboards at opposite ends of the hall and the lamps in the grounds being arranged on the same principle, total failure of lighting is practically impossible, and the private generating station in the grounds, where two 250 KW. producer and town gas-driven sets are installed, is not in commission this year, though it is, of course, available in case of emergency. Lead-covered mains in ducts with draw-in boxes are used to supply the lighting circuits and side-shows.

By far the greater part of the total electrical demand in this exhibition is for illuminating purposes. In outlining the various buildings some 100,000 5 C.P. 220 volt lamps are connected in simple parallel by strip cable with weatherproof screw sockets having rubber washers and filled-in backs. Carbon filament lamps are still used owing to the softness of the light which they provide and the long life which they yield. The simple parallel connection adopted restricts extinction to individual lamps. We would suggest that the time has now arrived when replacement of these carbon by metal filament lamps might well be taken in hand. Altering the wiring connections would involve considerable outlay, hence the best procedure would probably be to replace lamps on one branch circuit at a time, simultaneously connecting the latter to a step-down transformer. The Court of Progress, which contains excellent horticultural exhibits, is now illuminated by 16,000 miniature lamps and the number of lamps in the Elite Gardens has been increased to 13,000 and in the Court of Honour to 15,000. Several "living" signs representing flames, waving flags, an eagle with flapping wings, and so on are in course of construction. General lighting in the grounds is by enclosed arcs burning four in series and 36 hours per trim. As replacements become necessary the "works" of the arcs are being removed and half-watt lamps mounted in the arc lamp shell and globe. Similar replacements are being made as necessary in the 16-hour flame arcs used for interior illumination. As present the flame arcs placed above the drapery in the various buildings are trimmed from gang planks running across the roof girders. The necessity for this work is being

eliminated by use of half-watt lamps. Any reduction in the skilled staff required is of special importance in this case since men are engaged only from May to October. All lamps have dual suspension, main reliance being placed upon flexible steel ropes. A new L.C.C. regulation requires globes surrounding high candle-power filament lamps to be wired (as for arc lamps); the interpretation to be attached to "high candle-power" in this connection has not yet been specified. About one hundred 2,000 C.P. half-watt lamps are at present in use, besides a few 3,000 C.P. lamps used for searchlights in the Stadium. In this service there is said to be a deficiency in "carrying power" of light from half-watt as compared with that from arc lamps; but no definite data is available concerning the candle power of the latter.

In all, roughly 600,000 lamps are used to illuminate the grounds, buildings and side-shows. The lighting load on the mountain railway totals 20 H.P. The cascade in the Court of Honour is fed by two 24-inch Rees Roturbo centrifugal pumps driven by 50 H.P. three-phase induction motors and delivering 12,000 gallons per hour. Five hundred high-candle power metal lamps with dipped bulbs (of five different colours) are mounted behind the glass walls of the cascade, and to obtain unending variety of effects, manual control of a piano-key switchboard is employed in preference to an automatic system. An excellent scale model of the Panama Canal, 200 ft. in length, is installed in a room lighted by half-watt lamps. The canal lights are 4 C.P. 4-volt lamps connected in series across 25-volt A.C. supply leads and the submerged haulage chain for the model ships, the lock gates and the pumps for filling the locks are all electrically operated.

The power demand of the various side shows ranges from 1/16 H.P. to 100 H.P., the latter being that of the mountain railway, which is worked by 250-volt direct current on the 4-rail system. Each car is fitted with a 2½ H.P. motor and a complete automatic block signalling installation is provided with indicating and master-control board at the station. A warning signal is mounted in advance of each main signal post, and automatic solenoid-operated trip levers prevent drivers over-running danger signals. Lengths of dead track in the dips and at sharp bends eliminate the risk of excessive speed due to drivers leaving their controllers "on." The position of each train, of which eight may be running at once, is indicated continuously and automatically on a board at the station, and the stationmaster can cut current off from any one or from all sections of the line in case of need.

The Metropolitan Railway exhibit includes a full-sized "upper quadrant semaphore" signalling head and repeater arm working in conjunction with an electric indicator board. Immediately a train enters any signalling section the signal in the rear is *dropped* to the horizontal danger position in which it remains till, the train having entirely cleared the section and every component of the equipment being in perfect working order, the arm is *raised* to the oblique safety position in the upper quadrant. Any defect causes the arm to fall by gravity to the "danger" position. The lower "repeater" arm on each post is fishtailed and shows an orange instead of a red light. It is not a distant signal, but simply indicates whether the second section ahead is also clear. Automatic trips arrest within a few yards any train which is driven past a danger signal. In the reconstructed parts of the system, low tension alternating current is used for signalling purposes in order that any disturbance due to leakage current may be confined to the sections immediately concerned. The exhibits include examples of the step-down transformers and signalling relays employed and the latest type of hooded signal lamps. All the apparatus is shown in action and its method of working and the function and operation of junction control boards, automatic train describers and electric "headway" clocks are explained admirably to visitors by one of the company's employees. Altogether this exhibit is most interesting and instructive.

In conclusion, we have pleasure in acknowledging the assistance rendered by Mr. Albert E. Kiralfy in collecting the above information.

PARLIAMENTARY.

Telephone Contracts and Labour Rates.

MR. WILLIAM THORNE asked the Postmaster-General if he was aware that Messrs. Callenders, cable makers, had a contract with the Post Office for laying down telephone cables at Newport and district; if he was aware that the Newport master builders agreed to advance the wages of the various sections of men working in the building trade, which includes excavators, a ½d. per hour from May 23rd, 1914, and another ½d. per hour from May 1st, 1915; that the Newport town and district rate was now 6½d. per hour for labourers, and 7d. per hour for scaffolders; if he was aware that Messrs. Callenders had refused to pay the extra ½d. per hour to the labourers who were digging out the trenches for the cables; and if he intended taking any action in the matter to make the contractors pay the town rate, in accordance with the Fair Wages Clause Resolution of the House of Commons.—Mr. Hobhouse said that inquiries would be made.

Opposition to the London County Council Tramways Bills.

MR. YEO asked the Chairman of Ways and Means if his attention had been called to the statement that the expense of the petition of certain frontagers to the L.C.C. Tramways Bill was defrayed by the London omnibus owners, and whether such procedure was in accordance with the rules of the House.

MR. WHITLEY replied that there was nothing in the Standing Orders or Rules of the House to say that petitioners should only be heard if they paid their own costs, but he was quite sure that the members of Private Bill Committees knew the proper weight to give to any petition when they were in possession of all the facts connected with it.

York Corporation Bill.

LAST week the Local Legislation Committee of the House of Commons considered the Bill promoted by the York Corporation. The Bill was of an omnibus character and included powers for the running of trolley vehicles and motor-omnibuses. Mr. Macassey, K.C., and Mr. Beveridge represented the promoters, and the North-Eastern Railway Co., who opposed the tramway proposals, were represented by Mr. Talbot, K.C., Mr. Clode, K.C., and the Hon. E. Charteris.

MR. MACASSEY explained that the Corporation desired to run trolley vehicles on two routes, and the Railway Co. objected to the terminus of one route being in their station yard. He submitted that if the opposition was successful it would be a serious loss to the Corporation.

Evidence in support of the proposals was given by the Town Clerk, Mr. Meyer (chairman of the Tramways Committee), Mr. J. W. Hame (manager of the Tramways Department), Mr. C. J. Spencer (manager of the Bradford Corporation Tramways), and others.

MR. TALBOT, K.C., suggested that the turning point for the tramways should be either at Exhibition Square or Blossom Street.

The COMMITTEE decided to allow the turning point outside the station, on condition that if, in the opinion of the Board of Trade, the traffic became so congested as to make it desirable to be moved to another place, this should be done to a place approved by the Board.

North Metropolitan Electric Power Bill.

THE Court of Referees of the House of Commons have decided that the L.C.C. and the London electric lighting companies shall be allowed to appear before the Select Committee which considers the Bill promoted by the North Metropolitan Electric Power Supply Co. for the erection of a generating station at St. Albans, &c., the raising of new capital, and the obtaining of electric current from other sources.

MR. TYLDESLEY JONES, for the promoters, urged that neither the County Council nor the electric lighting company supplying in London had any *locus standi*.

MR. FITZGERALD pointed out that the L.C.C. would be the purchasing authority in about 17 years' time, and they were now considering what steps should be taken to meet the position when the time arrived. It was true that the North Metropolitan Power Co. was outside the county, but it supplied electricity in bulk to Stoke Newington.

MR. FREEMAN, K.C., on behalf of the electricity undertakings within the county, said that under the Bill the North Metropolitan Co. were asking for powers to be allowed to obtain additional electricity from the Metropolitan Railway Co. and the London and North-Western Railway Co. He contended that it was not legitimate for the company to obtain power in this way to sell to the public.

The grounds on which the Court decided that the petitioners should be allowed to appear before the Select Committee were that the measure would make an important alteration in the existing practice.

Newcastle-on-Tyne Corporation Bill.

ON Friday, June 19th, Sir John Barran's Select Committee of the House of Commons concluded their consideration of the Bill of the Newcastle-on-Tyne Corporation, which asks for powers for the construction and working of tramways in the Urban Districts of Longbenton and Weetslade, &c.

MR. H. LLOYD, K.C., gave details as to the tramway undertaking of the Corporation, and said that last year £18,000 was contributed to the relief of the rates. The proposals in the Bill were to make two new tramway lines to the north from the city boundary. One would run through the Urban District of Longbenton and for a short distance in the West Weetslade Urban District. The second tramway would join with the first one and pass to the east, and serve the populous districts of Forest Hall. Except for the opposition of the Killingworth Estate Trustees, the only objection came from the North-Eastern Railway Co.

A great deal of local evidence was called in support of the proposals.

Questioned by the CHAIRMAN, MR. E. HATTON, engineer and manager of the tramways, said the Committee had considered the question of a 'bus service instead of a tramway service of the proposed routes, but they felt that omnibuses would be totally inadequate to deal with the race traffic.

The Committee passed the preamble of the Bill, subject to the following conditions:—(1) That the promoters should insert a clause providing that the powers to construct tramway No. 1 beyond Salter's Lane should not be exercised until Great Lime Road had been widened; (2) that a clause should be inserted compelling the promoters to give Gosforth a service of cars on race days between certain points of not less than 3½ minutes' interval.

Third Reading.—In the House of Commons on June 18th the Stone Gas and Electricity Bill was read a third time.

LEGAL.

Ilford Gas Co., *v.* Ilford Urban District Council.

[Preferential Rates for Electrical Supply.]

In the Chancery Division on Friday, June 19th, Mr. Justice Sargant had before him a motion by the plaintiffs in the action of the Attorney-General at the relation of the Ilford Gas Co., *v.* the Ilford Urban District Council for interim relief in respect of alleged illegalities in the supply of electricity and electric fittings.

Mr. Mark Romer, K.C., who with Mr. Tyldesley Jones appeared for the plaintiffs, said that the case was a similar one to that recently tried by his Lordship (Attorney-General *v.* Long Eaton U.D.C.), and they were asking for an injunction to restrain preferential treatment contrary to the provisions of the Act of Parliament. In this case the plaintiffs were also asking for an injunction to restrain the defendants from electric fitting or supplying electric apparatus *ultra vires*. Notice of motion had been served, but he did not know whether the defendants were ready to go on, or whether they desired an adjournment to answer the plaintiffs' evidence.

Mr. Martelli, K.C., for the defendants, said they had not filed any evidence yet, and, of course, they wanted time for that purpose if the motion was to be proceeded with. He thought, however, it would be quite impossible to dispose of the main part of the action on interlocutory motion, although his Lordship had recently decided a case that was somewhat similar.

Mr. Justice Sargant said that his recollection was that in that case he threw out the suggestion that there might have been much more elaborate evidence.

Mr. Martelli said the plaintiffs seemed to think that they had an *a fortiori* case, but he thought it was found to be anything but that.

Mr. Romer said this was a much stronger case than the previous one, as the defendants in this case were differentiating solely between those who took a whole electric supply, and those who did not. There was no question of power in this case.

Mr. Justice Sargant suggested that if the matter stood over for a week, the parties would have the opportunity of considering the evidence, and they could then say whether it should be tried on motion or not.

Mr. Martelli doubted whether the defendants' evidence would be ready in a week.

His Lordship thought it could not be a matter of very great urgency.

Mr. Romer said it was, for in addition the plaintiffs were seeking to restrain them from spending the ratepayers' money.

Mr. Martelli said that the Council were quite ready to give an undertaking not to spend any more money in the purchase of fittings, or in providing, selling, or letting out on hire any electrical apparatus, and not to enter into any fresh contracts for providing, selling, or letting out on hire any electric lamps or the like. The defendants, however, desired to go on with the contracts that they had already entered into, and to complete them, for it could not be an advantage to anyone, even to the ratepayers paying the money, that these contracts should lapse.

Mr. Romer desired to know exactly what the defendants were prepared not to do.

Mr. Martelli: They would not spend any further money in the purchase of electric lamps or electric plant.

Mr. Romer: Over next Friday week?

Mr. Martelli suggested that the undertaking should be until the trial of the action.

Mr. Romer desired, however, to bring on the motion, and said that there was also a question of the defendants' right to have a showroom for their electrical appliances.

Mr. Martelli said there was no question about the showroom whatever. They never had one, and did not intend to. They were authorised by the Local Government Board to expend money in building an office, and in that office they were putting a window for displaying the fittings.

Mr. Romer: If the defendants say they are not fitting up a showroom, and don't intend to do so, that is enough for me.

Mr. Martelli said that it was obvious that the question could not be determined on motion. It was one of the utmost importance to every electric lighting authority in the country.

Mr. Romer: And we say it has been decided.

Mr. Martelli said this case differed from the previous one, and, moreover that case was likely to go before the Court of Appeal.

Mr. Romer said if the matter went over for a fortnight they would get the evidence and be better able then to appreciate the position.

Mr. Justice Sargant accordingly directed the motion to stand over for a fortnight on the undertaking offered by the defendants.

Godfrey *v.* Cox.

This case, which was a claim for the electrification of a house at Clapham, and which was heard and judgment given in May, by Mr. Muir Mackenzie, one of the Official Referees of the High Courts, was mentioned on a question of costs.

Counsel applied to have the Referee's judgment varied so far as the order for the payment of costs was concerned.

The Referee: What business has a litigant to ask me to vary my judgment.

Counsel: The parties have agreed as there seems to have been a mistake.

The Referee: I am not going to alter my decision in accordance with any agreement between the parties.

Counsel: But this seems to have been an error on the part of the person who drew up the judgment.

The Referee: I drew it up myself. There has been no slip or error as you suggest, and if you think there has been an error then it will be for the Divisional Court to correct it. I can do nothing.

Lindeck, Cahn & Co. *v.* Dubilier Electrical Syndicate, Ltd.

Before the Common Serjeant (Sir F. Bosanquet, K.C.), and a jury, plaintiffs, stockbrokers and members of the London Stock Exchange, sought to recover a sum of money as commission, from the Dubilier Electrical Syndicate, Ltd., of 96, Leadenhall Street, E.C.

Mr. Morton Smith (instructed by Messrs. Michael Abrahams and Co.) appeared for the plaintiffs, while the defendants were represented by Mr. E. G. Palmer (instructed by Messrs. A. Veasey and Co.).

On behalf of the plaintiffs, it was stated that in 1912 Mr. McLean, the promoter of the defendant syndicate, approached Messrs. Lindeck, Cahn & Co. He asked them to take an interest in the concern, and they agreed to do so, and became shareholders. The syndicate was formed to work certain patents in connection with wireless telegraphy. In the early part of last year the syndicate required further financial support, and again approached the plaintiffs. The latter were then told that they could take all instructions from McLean, and that gentleman was held out as the agent of the syndicate. The plaintiffs interested themselves on the syndicate's behalf, and finally approached the General Electric Co., Ltd. Mr. McLean then suggested that in order to save time he should negotiate directly with the General Electric Co., and not through the plaintiffs. That was assented to, and the negotiations were carried out by Mr. McLean, with the result that the General Electric Co., Ltd., paid £1,000 in cash, and agreed to pay a further £1,500 for a licence to work the patents. In addition, the syndicate was to receive a royalty on all apparatus which the General Electric Co. made under the patents. The plaintiffs said that the sale was carried through in consequence of their introduction, and claimed to be entitled to commission at the rate of 5 per cent. Originally Mr. McLean was joined as a defendant in the action, but owing to his absence in America he was not served, and the proceedings against him were abandoned. On behalf of the defendant syndicate it was stated that the concern was registered in April, 1912, to acquire the British and Colonial rights of patents in connection with wireless telegraphy. Mr. MacLean was not directly associated with the syndicate in any way, but was a shareholder with 400 shares. The company possessed a capital of £10,000, of which £2,000 was subscribed for in cash, while shares of the face value of £4,900 were issued to the owner of the patents. In May, 1913, it was proposed to form a much larger company to work the patents, but the matter fell through. It was denied that the syndicate gave Mr. McLean instructions to act on their behalf. That gentleman, however, arranged the transaction with the General Electric Co., and as remuneration it was agreed that he should receive a commission of 40 per cent. on the £1,000 which the syndicate received. Mr. McLean had told the syndicate that there were certain expenses he had incurred, and that he would also have to make a payment to Messrs. Lindeck, Cahn & Co. The jury returned a verdict for the plaintiffs for £80.

Action Against Aberdeen Corporation Dismissed.

The First Division of the Court of Session has dismissed an action for damages against Aberdeen Corporation raised by the family of a carter who was crushed between a wagon and an electric standard on the pavement, and fatally injured. The Lord President held that it was out of the question to suggest that public authorities were at fault, because they had lamp-posts or electric standards or trees placed at the edge of the pavement, or on the footpath, even although the street were a narrow one. Lord Skerrington said in altering the position of the standard after the accident, the Corporation acted quite rightly, but he could not bring himself to think that they ought to have anticipated that an accident would occur such as to lead to the death of this unfortunate man.

Publicity Literature.—The County of London Electric Supply Co., Ltd., of Moorgate Court, has issued a little publicity leaflet with a diagram showing the gradual darkening of the ceiling from April (after the spring cleaning) to the following March, in the case of a house that is not lighted electrically.

NEW ELECTRICAL DEVICES, FITTINGS AND PLANT.

Pipe-Ventilated Motor.

Fig. 1 shows the latest type of 50-B.H.P. D.C. 440-volt motor made by Messrs. McClure & Whitfield, of Mersey Dynamo Works, Stockport, for driving a calender in a finishing works; the motor runs normally at 350 R.P.M., and up to 600 R.P.M. with shunt regulation. The machine is totally enclosed, and has an exhaust fan embodied in its design; the inlet is connected by a pipe to the outer atmosphere, and foreign matter, which is liable to give

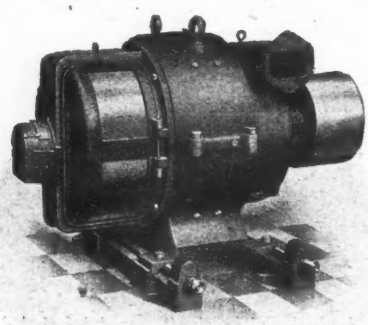
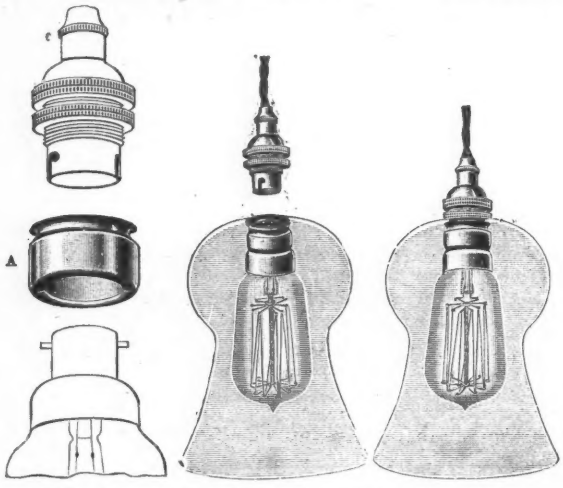


Fig. 1.—Pipe-Ventilated Motor.

trouble with pipe-ventilated motors, is excluded by a system of packings devised by the makers, which prevents its entry through small crevices. Although the motor is totally enclosed, the temperature rise is similar to that of the open type. The makers have installed a number of these machines in places where dust and dirt are prevalent.

"Lamlok" Shade Carrier and Lamp Lock.

The accompanying illustrations show the ingenious device by which Mr. C. H. Jeffcoat, of 148, Addison Gardens, London, W., accomplishes two purposes—locking the lamp in position, and facilitating the attachment and removal of the shade, no matter how narrow the latter may be—with one small fitting, the ring marked A. This is placed on the cap of the lamp, and the shade



Figs. 2-4.—Lamlok Shade Carrier and Lamp Lock.

on top of the ring, as shown in one of the figures; the lamp cap is then inserted into the holder, and the ordinary shade ring, which is usually inside the shade, is in this case screwed *down* on the top of the shade. The bayonet joint is thus locked. There is nothing to get out of order, and the cost of the device is trifling; it is easy to remove the shade for cleaning, and the carrier can be used with any type of lamp.

Magnetic Separation of Iron Ore from Gangue.

An interesting modification of the usual method of separating magnetic iron ore from gangue is employed at Messrs. Witherbee, Sherman & Co.'s mines, Mineville, N.Y., where it is applied to 0·25 in. lumps or finer ones. The belt feeding the crude ore is placed with respect to the take-off belt as shown in the diagram, fig. 5. A series of electromagnets is suspended above the lower span of the take-off belt, and the coils are connected so that adjacent magnets are of opposite polarity. As the crude ore on the feed belt passes under the first magnet the magnetic ore is attracted to the take-off belt while the gangue drops off into the tailings hopper.

The particles of ore in being carried along by the take-off belt have first one end attracted by one magnet and then the other attracted by the adjoining pole-piece, because of the changing polarity. This turn-over process continually mixes up the ore and allows the gangue to drop out. The concentrated ore drops off the take-off belt in the concentrates hopper after passing the last magnet. The bulk of material delivered from this hopper to the rolls and final treating machine is thus reduced, without in any

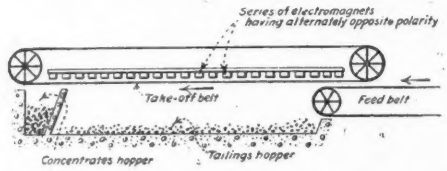


Fig. 5.—Diagram Illustrating the Magnetic Separation of Iron Ore from Gangue.

way sacrificing the iron content. Direct current at 125 volts is used in the magnets. From 3 amperes to 7 amperes is required in the belt machines, depending on the size of the ore handled. The degree of refinement obtained depends partly on the attractive force of the magnets, the air-gap and the belt speed.—*Electrical World.*

B.T.H. "Calorite" Electric Stove.

The British Thomson-Houston Co., Ltd., Rugby, are introducing a new stove under the above title, for boiling water and stewing, frying and steaming; it is made of materials not easily injured by heat, moisture or grease, and is of simple and substantial construction, with few component parts. The heating surface is an annealed casting with a machined face 6½ in. square, and is clamped to a frame provided with legs, which have porcelain feet, to prevent the transmission of heat to any article on which the stove is placed. The heating element is of "Calorite" metal, which has a very high melting point—about 2,800° F. Worn-out

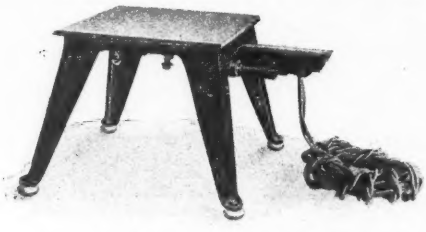


Fig. 6.—B.T.H. "Calorite" Stove.

parts are easily replaced. The terminals are provided with a sheath, which protects the user from contact with live parts, and the flexible from damage in the event of liquid boiling over. The stove takes 1,000 watts, and will boil a pint of cold water in eight minutes, starting with the stove cold; once it is hot, it will boil a pint in five minutes. Ordinary cooking utensils are used, preferably, of course, with flat bottoms.

The Rex Lock Nut.

Another new patent lock nut has been brought to our notice, this time by the Rex Lock Nut Co., of Winchester House, Victoria Square, Birmingham. Judging by a sample bolt and nut before us, the nut is both novel and effective. It depends for its action upon a pawl actuated by a spring; the pawl is pivoted in a slot, and has a sharp-cornered heel, which engages with the summits of the threads and exerts a grip which is the more tenacious in proportion as the effort to unscrew the nut is greater. The application of a spanner to the nut from any direction to unscrew the latter, however, automatically releases the lock by

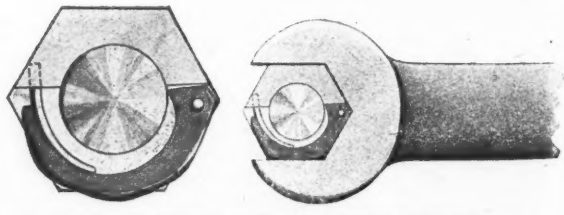


Fig. 7.—Section of Rex Lock Nut, jammed.
Fig. 8.—Section of Lock Nut, Lock released by Spanner.

holding the pawl clear of the threads. The nut can be screwed on with the fingers, but cannot easily be removed without a spanner, and certainly cannot be jarred off by any vibration. The accompanying sectional illustration, fig. 7, shows the pawl in the

gripping position. The nut obviously cannot be accidentally put on the wrong way up. Fig. 8 shows how the spanner releases the lock. It would seem that the slot would weaken the nut; a test by Prof. S. M. Dixon, of Birmingham University, on a ½-in. bolt and nut showed that the bolt was the weaker of the two, and other tests which he made bore out the makers' claim that the nut could not be shaken off the bolt.

BUSINESS NOTES.

The Panama Canal and South American Trade.—We print the following interesting editorial comments from the pages of our American contemporary the *India-Rubber World*. That journal has naturally, because of the particular material and commodity in which it specialises, made a very close study of the South American Continent for many years, and its Editor has, we believe, made a number of tours for that purpose. The opinions expressed can, therefore, safely be regarded as those of an American expert authority on the effect of the Panama Canal upon the international trade position:—

"Much has been said about the vast new market for American goods which will be opened up on the completion of the Panama Canal, and the manufacturers of the United States have been entreated to make ample preparations to occupy this market before it has been preempted by our active rivals across the water. This is good advice, and American goods ought certainly to be much more largely in evidence on the West Coast of South America than they ever have been along its Atlantic side.

"On the surface, at least, it looks as if this new market were most promising. Here is a vast stretch of territory extending from the Pacific to the Andes, and over the Andes, and reaching from the Isthmus of Panama to the Strait of Magellan—a distance of almost 5,000 miles—and occupied by about 15,000,000 people, who hitherto have been so remote as to be of comparatively little interest to us, but who now, in the matter of trade, are to be brought almost to our doors. This would certainly seem like a great opportunity for extending our commerce.

"But here is an instance where enthusiasm should be tempered with discretion, for these 15,000,000 people are not altogether like an equal number of our own countrymen. In fact, the situation is far otherwise. To go a little into detail, there is Colombia with 5,000,000 inhabitants, only 300,000 of whom are white, the rest being of mixed breeds or Indians and negroes; and Ecuador, with 1,500,000 people, only 150,000 of them being white and 1,000,000 of them being Indians; and so on down the coast. Of the 15,000,000 the Caucasian element represents about one-eighth. The mestizos, or mixed race, constitute a little less than one-half, while the rest of this aggregation—or nearly one-half—is composed of negroes and Indians. Obviously, this is quite a different market from any that the American manufacturer is familiar with. Its ability to absorb manufactured goods in great variety and in large quantities has yet to be proved.

"The opening of the Canal will undoubtedly substantially increase the prosperity and the buying power of our neighbours along the West Coast of South America, and these communities will begin to develop as never before, but in view of the ethnological character of a vast majority of these people, this development is not likely to be phenomenally rapid. It seems quite safe to predicate, therefore, that while the Panama Canal will assuredly open up a new and ever-expanding market for American goods, it is a market that must be investigated with care and entered with considerable circumspection."

Railway Station Lighting.—MESSRS. SIEMENS BROS. DYNAMO WORKS, LTD., of Dalston, have sent us two illustrations—one of the exterior, and another of certain platforms, of a well-known London terminus where Wotan half-watt lamps have been applied for lighting. The photographs were taken about midnight. The photograph of the platform illumination shows in skeleton, two trains which drew up to the platform and out again during the time necessary for the exposure of the plate, while the headlights of passing vehicles are discernable on the other. The lighting effect is thoroughly efficient. In these installations Wotan half-watt lamps of 1,000 C.P., running two in series on a 200-volt circuit, are being used to replace a portion of the arc lighting. The existing arc lamp fittings have been converted for use with half-watt lamps in order to keep a uniformity of fitting, and it is quite probable that further circuits will be re-arranged in a similar manner in the near future.

Bankruptcy Proceedings.—PERCY RAPHAEL, lately carrying on business as a fur and skin merchant at 2, Edmund Place, Aldersgate Street, E.C., under the style of P. Raphael & Co. A sequel to the Grindell-Matthews Wireless Telephone undertaking, was to be found at the London Bankruptcy Court in this public examination. The debtor attended last week before Mr. Registrar Brougham upon accounts showing liabilities £7,523 and assets *nil*. He stated that for some years he had carried on business with success, but in 1910 the slump in "raw fur" set in, and the following was a most disastrous year in the fur trade; he made some heavy bad debts, and in January, 1912, he arranged to pay a composition of 6s. in the £ on liabilities amounting to £10,000. He paid 5s., but was unable to provide the remaining instalment, and £6,506 of his present liability represented the balance of 15s. in the £ due to the trade creditors. In October, 1912, witness made the acquaintance of Mr. Grindell-Matthews, who was the holder of a very clever invention for wireless telephony, and had formed a syndicate to exploit the patents. Works were erected at Letchworth and Northampton, and negotiations were entered upon for the flotation of a big company, with a nominal capital of £500,000. Full arrangements were made for the necessary capital to be underwritten, and witness assisted in the promotion by providing in all about £1,600. A cross-channel demonstration was to be given, but the Postmaster-General refused his sanction thereto, with the result that the underwriters withdrew, and the debenture-holders took possession of the patents; the syndicate went into liquidation, and witness lost all his investment. The examination was concluded.

T. CALLENDER (Shamrock Cycle Co.), electrical engineer, Nottingham.—A second and final dividend of 9d. in the £ is payable on June 29th, at the Official Receiver's offices, 4, Castle Place, Park Street, Nottingham.

An Ediswan Showroom.—The illustration, of which we give a reproduction, represents the interior of the EDISON & SWAN Co.'s new West-End showroom, at 71, Victoria Street, Westminster, S.W. The decorative colour scheme is, of course, not apparent, but the volume and display of the showroom is easily discernable. The range of fancy fittings, from small wall brackets to the more expensive ceiling fittings, makes a very varied and

EDISON & SWAN CO.'S NEW WEST-END SHOWROOM.

pleasing show. Cooking apparatus, ranging from shaving-water heaters to electric cooking ovens, Ediswan fans and radiators, Royal Ediswan drawn-wire and carbon lamps, Ediswan accessories, and ironclad switchgear are included. The trade are invited to take their clients to Victoria Street to make their selections of either fancy fittings or cooking appliances.

South Africa.—The South African Customs authorities have recently given a decision to the effect that "electric batteries—refills for hand torches or pocket lamps," when imported separately, are to be classified under No. 98*a* of the Tariff, the duty being 3 per cent. on foreign manufactures, British goods being admitted free of duty. When the refills are imported as parts of torches and pocket lamps, they are to be classified under No. 175 of the Tariff, the duty under which is 15 per cent. *ad valorem* in the case of foreign, and 12 per cent. on British goods.

Bastian Meters.—In view of the increasing adoption of the electric light in small houses, and the disproportionate cost of the service and meter in such cases, the announcement of a reduction of the price of the Bastian meter to a very low figure will be welcomed by supply authorities. The electrolytic meter has the great advantage that it records the whole of the electricity consumed even by a single lamp of the smallest size—or by a leak on the circuit!—a very important consideration when 10-watt lamps are employed. There is also nothing in the meter that wears out or requires periodical adjustment, and the meter, as a rule, needs resetting only about once a year. For small consumers on D.C. circuits it possesses distinct advantages.

Liquidations.—CONSOLIDATED DIESEL ENGINE MANUFACTURERS, LTD.—A petition for the compulsory winding up has been presented by Mr. W. Lawrence the younger (W. Lawrence and Son), building contractor, of 21, Finsbury Circus, E.C., creditor, and will be heard on June 30th.

WAKELIN BROS., LTD., 9, Tottenham Street, W.C. Trustee (Mr. W. A. Henderson, 3, Fenchurch Street, E.C.) released May 22nd.

THE STREET LIGHTING CO., LTD.—Particulars of claims must be sent by July 10th to the liquidator, Mr. W. Blease, 8, Fenwick Street, Liverpool.

For Sale.—Devonport Borough Electricity Department has for disposal a 150-KW. D.C. generating set, 460-585 volts. Particulars are given in our advertisement pages to-day.

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Henley's at Windsor.—A large number of the members of Messrs. W. T. Henley's head office staff had a most enjoyable trip up the River on Saturday last. The programme allowed a two hours' stay at Windsor, where luncheon was partaken of; the party then returned to Hampton Court, stopping at Staines for tea on the lawn of the Bridge House Hotel.

Trade Announcements.—MESSRS. KRUPKA & JACOBY, LTD., are removing to 39, Victoria Street, Westminster, S.W., where they have more commodious offices and stores. All communications should be addressed there in future. Telephone Nos. Victoria 6644 and 6645.

MESSRS. MILLAR & STEWART have opened new premises at 42, George Street, Edinburgh, where five floors have been fitted up as showrooms for all kinds of electrical manufactures. An automatic push-button electric lift gives access to all floors. There is a trade entrance at 32, Rose Street (North Lane), where stores for accessories, lamps, cables, &c., are situated.

MR. J. D. LINDSAY, for nearly six years manager of Messrs. Crompton & Co.'s Newcastle office, has recently started business on his own account at 90, Pilgrim Street, Newcastle-on-Tyne, as agent for Messrs. Bruce Peebles & Co., Ltd, Messrs. James Howden and Co., Ltd., and Mr. George Ellison, of Birmingham. Mr. Lindsay only deals with land installations for Messrs. James Howden & Co., their forced-draught business being controlled as heretofore.

Water-Softening by "Permutit."—A party of water engineers visited the Hooton Waterworks, on June 13th, to inspect the "Permutit" water-softening plant which the West Cheshire Water Co. has been the first water authority in the United Kingdom to install for the purpose of purifying water for public supply. The water treated is obtained from boreholes about 800 ft. deep, and has an initial hardness of about 19° Clarke. The company is bound by Act of Parliament to supply water of 10° of hardness, and after the investigation of various systems of water-softening, it was resolved to install the "Permutit" system, which is largely used in Germany for the same purpose. The process, which we have previously described, is based on an exchange of the calcium and magnesium salts from the hardness of the water for the sodium, which is the replaceable base in the "Permutit." The "Permutit," which is insoluble in water and undergoes no visible change, is capable of being revivified over and over again by the simple application of a solution of common salt, which expels the lime and magnesia from combination, and reinstates the sodium. The capacity of the softening plant at Hooton is 1,000,000 gallons daily. The water is softened to zero, and is mixed with an equal quantity of hard water at 19°, the resultant 2,000,000 gallons being sent to the mains with a hardness of 9½°. The plant is looked after by two men.

Book Notices.—*Journal* of the Institution of Mechanical Engineers. No. 1, June, 1914. London: The Institution.—The *Journal* is a new publication, supplementary to the *Proceedings*, and is intended to bring members resident in the country or abroad into closer touch with the current work of the Institution; it will be published once a month during the session. After this year it will replace the *Proceedings*. Following the American practice, it is divided into two parts, with independent pagination; the first part deals with general information, and includes a précis of the next paper to be read, which will enable a reader to judge whether the paper deals with matter in which he is especially interested, in which case he can obtain a copy of it in advance. The contents of Part I being of ephemeral interest, it is not intended to be permanently retained, and is, therefore, printed on thin paper. Part II is the permanent record of the *Proceedings*; at present it is printed on thin paper, but next year it will supersede the ordinary *Proceedings* and will be printed on the same class of paper as is now used for the latter. It is hoped that it will be possible to place in the hands of every member a complete copy of each paper, with a report of the discussion, within three weeks of the date of reading. It is proposed also to make arrangements for reading the papers simultaneously at various local centres.

The present issue gives particulars of the Summer Meeting to be held in Paris and Northern France, beginning on Monday, July 6th.

Glover's Almanac.—We have just received Messrs. W. T. Glover & Co.'s Almanac for 1914-15—the thirteenth issue of this unique compendium of instructive and amusing items. The present issue is arranged with a view to driving home the idea suggested in one sheet by following it up and enlarging upon it in subsequent sheets; but this is not carried to the point where it becomes wearisome, and the comic sketches which are interspersed enliven the reading, so that, having begun to turn over the pages, one finds it difficult to stop. But an old friend can be welcomed with few words, and we need not emphasise the merits of this clever production, which seems to have become a permanent institution.

"*Proceedings* of the American Institute of Electrical Engineers." Vol. XXXIII, No. 6. June. New York: The Institute. Price $1.

"Handbuch der Elektrizität und des Magnetismus." By Prof. Dr. L. Graetz. Leipzig: J. A. Barth. Price M. 5.40.

"Mehrfach-Telegraphen." By A. Kratz. Brunswick: Vieweg und Sohn. Price M. 10.

"Electrical Engineering." (A First Year Course.) By Frank Shaw. London: George Routledge & Sons, Ltd. Price 2s. net.

"Questions and Answers about Electrical Apparatus." By J. W. Craig and W. P. Woodward. London: S. Rentell & Co., Ltd. Price 6s. 6d.

"Cours d'Electricité Théorique." By J. B. Pomey and L. Lecournu. Vol. I. Paris: Gauthier-Villars et Cie. Price 13 fr.

Catalogues and Lists.—MESSRS. J. H. HOLMES & CO., Newcastle-on-Tyne.—Pamphlet No. 34A contains a description, with illustrations, of the firm's H.T. ironclad switchgear for mining and sub-station work, with prices, weights and dimensions, and code-words.

MESSRS. KRUPKA & JACOBY, LTD., 39, Victoria Street, Westminster, S.W.—Illustrated price list of electrical conduits and fittings.

THE SUN ELECTRICAL CO., LTD., 118 and 120, Charing Cross Road, London, W.C.—Pamphlet No. 259 gives particulars and revised prices of Rawlplugs for electric installation work.

MESSRS. EDISON ACCUMULATORS, LTD., 2 and 3, Duke Street, London, S.W.—Twenty-page catalogue of electric pleasure cars manufactured by Arrol-Johnston, Ltd., and fitted with Edison accumulators. Descriptive matter appears relating to the chassis design, the Edison battery, and the Sangamo meter.

THE CARBON CO., Carron.—A hanging coloured showcard advertising the Carron electric cooking range in a very attractive setting, the object being to introduce such apparatus into shooting lodges, &c.

MR. EDWARD WHITE, Redditch.—8-page illustrated pamphlet showing polishing and scouring machines for small metal goods and steel toy trades.

MESSRS. BALCKE & CO., LTD., Broadway Court, Broadway, London, S.W.—List No. 314 gives an illustrated description of the Balcke-Harle exhaust steam accumulator, which they are just introducing on the English market.

ALLGEMEINE ELEKTRICITATS GESELLSCHAFT.—Price lists of "Nitra" lamps, from 200 to 3,000 C.P., reflectors, &c., and low-voltage Nitra lamps for 50 to 200 C.P., 14 to 25 volts, to be used with transformers. Leaflets relating to motor-driven pumps, blowers, machine-tools and rolling-mill auxiliaries.

MESSRS. R. W. HAYLOCK & SON, 63, Queen Victoria Street, London, E.C.—Illustrated leaflet showing the "Hotpoint" El Boilo electric immersion heater, and various electric heating and cooking apparatus.

THE ELECTRICAL CO., LTD., Charing Cross Road, London, W.C.—The *E.C. Journal* for June contains, in addition to the usual features, illustrated articles on the A.E.G. turbine factory, electric incubators and rearers for chickens, and the manufacture of rubber-insulated wires.

THE BRITISH THOMSON-HOUSTON CO., LTD., 77, Upper Thames Street, London, E.C.—The *Mazda House News* for May-June contains photographic reproductions of a number of views showing the Mazda lighting of a large London factory; other subjects dealt with are: Shop window lighting; hospital lighting; the lighting of a squash racket court.

THE BRITISH ALUMINIUM CO., LTD., 109, Queen Victoria Street, London, E.C.—A most attractively-produced pamphlet of 32 pages dealing with aluminium insulated cables. In the introductory pages the main objections that are raised against the adoption of aluminium insulated cables are discussed, such as—doubtful economy, difficulty of working and jointing, and low scrap value. The rating of cables is then fully considered, comparative cable ratings being shown by a number of curves. Low-tension cables (vulcanised bitumen and paper-lead cables, and vulcanised india-rubber cables), also high-tension cables and jointing of cables are all discussed and illustrated.

MESSRS. PASS & SEYMOUR, INC., Solvay, N.Y.—Catalogue No. 22, of 80 pages, gives illustrations, descriptions and prices of a variety of electric wiring devices, including lamp sockets and switches, the "Shurlock" socket, wall receptacles, porcelain sockets, &c.

THE EDISON & SWAN UNITED ELECTRIC LIGHT CO., LTD., Ponder's End.—32-page catalogue of Ediswan bells for various classes of service, including fire, engine-house and mining type bells, indicators, batteries, pushes, burglar alarms and accessories.

MESSRS. ATKINSON BROS., Aire Place, Kirkstall Road, Leeds.—Several illustrated circulars giving particulars and prices of electric drills, small motors, ball-bearing electric fans, box-blade fans, &c.

THE THERMAL SYNDICATE, LTD., Wallsend-on-Tyne.—Forty-four-page illustrated and descriptive publication dealing with their pure fused silica ware, manufactured by patent process, for use in chemical and other industries.

MESSRS. J. J. EASTICK & SONS, Oldhill Street Mews, Clapton Common, N.E.—Illustrated list describing and pricing their Chromolyte electric hand lamps, and electrolyte for same.

THE BRITISH PROMETHEUS CO., LTD., Salop Street Works, Highgate, Birmingham.—Leaflet No. 156 contains illustrations of a variety of designs of electric kettles, and tabulates prices and code-words for same.

THE SYNCHRONOME CO., LTD., 32, Clerkenwell Road, London, E.C.—Pamphlet describing the "Horophone" for receiving wireless messages, especially time signals. Particulars are also given corrected to the current month regarding the wireless signals dispatched from the Eiffel Tower and Norddeich, together with notes regarding aerials, weather reports, &c.

Meters Approved.—The Board of Trade has approved of the following meters:—

Siemens-Schuckert unit meter type W 3, deposited by Siemens Bros. Dynamo Works, Ltd., April, 1913.

D.C. watt-hour meter type L RA, deposited by the Electrical Co., Ltd., meter department, May, 1914.

The Pirelli Cable Works. — *The Southampton Pictorial* contains some pictures of the Western Shore, Southampton, in 1774, and at the present time. The second illustration shows the Pirelli new works, which are rapidly nearing completion.

The Salvation Army Congress Hall.—To accommodate the great Salvation Army Congress which has just been held in London, a temporary hall was erected on the vacant land at the junction of Kingsway with the Strand, and was equipped with an electric lighting installation by Messrs. Francis Polden and Co., who decided to use half-watt Osram lamps. Two distinct services were led into the building through distribution boards in the entrance hall, where all control was effected, and alternate lamps throughout were on the same service, so that the chance of the building being put into darkness by failure of the supply was extremely remote. All the wiring above 20 ft. from the ground was carried on porcelain insulators well away from any woodwork and the walls. The interior lighting was effected by means of 24 50-volt, 300-watt "Half-Watt" Osram lamps, giving approximately 600 C.P. each, enclosed in G.E.C. polished brass special "Half-Watt" fittings, with "Superlux" bowls and reflectors, and for the outside lighting on the Strand front two 100-volt, 500-watt half-watt Osram lamps of approximately 1,000 C.P. each were enclosed in lanterns with "Superlux" globes. The General Electric Co., Ltd., supplied the Osram lamps and the fittings.

The Electrical Industry in Wolverhampton.—In the annual report of the Wolverhampton Chamber of Commerce, just issued, it is stated:—"The volume of work in this industry has been well maintained during the past 12 months. The use of electricity for power applications, wireless telegraphy, chemical processes, lighting, heating, cooking, and a great variety of other purposes, continues to expand. Competition for business is not so reckless as it was in former years, and the industry is therefore more stable and settled. The local factories have been well supplied with orders, and have good bookings ahead. Some of them have found it necessary to increase their buildings and plant to cope with the demand made upon them."

LIGHTING and POWER NOTES.

Aberdeen.—PUBLIC LIGHTING.—Schemes for improving the lighting of Rosemount are before the T.C. They include electric lighting, high-pressure gas, and gas lighting with double-inverted burners. The latter plan is recommended by a Committee.

Aldershot.—DIESEL ENGINE VIBRATION.—A writ has been served on the U.D.C. by a resident who alleges that a nuisance exists through the vibration of the Diesel engine at the electricity works; the B.C. has decided to defend the action, and, if so advised, to join the Diesel Engine Co. as third parties.

Barnes (Surrey).—The U.D.C. has referred to the Law and Parliamentary Committee the question of applying for powers to purchase and lend on hire electrical appliances and fittings.

The Council has decided to supply current for power purposes to Messrs. Watney, Combe, Reid & Co., for four years, with an annual consumption of not less than 150,000 units, at 9d. per unit. A special cable will be laid.

Barrow.—The Education Committee has approved a scheme for the provision of a laboratory for experimental work in connection with heat engines, at a cost of £1,200; £50 was allowed for an E.L. installation.

Beckenham.—PROPOSED NEW PLANT.—The U.D.C. has decided to apply to the L.G.B. for sanction to a loan of £2,233 for a 500-KW. condenser, and £570 for a 120-KW. D.C. tramway generator.

Bury St. Edmunds.—FREE WIRING.—The T.C. has adopted a system of free wiring for electric light through a contractor. As an experiment, not more than 12 houses, of a rental of not less than £14 a year, will be wired.

Canada.—The Michigan Northern Power Co. and the Algoma Steel Corporation have been authorised to divert 30,000 cb. ft. of water per second from the river, which means the development at Sault Ste Marie of 106,000 H.P. of electricity. The cost of the development will be $13,250,000.—*Canadian Engineer.*

Cheadle and Gatley.—PROPOSED E.L.—A deputation from the U.D.C. is to interview representatives of the Manchester and Stockport T.C.s regarding terms for a supply of electricity in the district.

China.—A sum of 700,000 taels has been voted for additional plant at the Riverside electricity works, Shanghai.—*Indian Textile Journal.*

Colwyn Bay.—PROMENADE LIGHTING.—The U.D.C. has decided to light part of Cayley Promenade Road with electricity.

Consett.—E.L. SCHEME.—The U.D.C. has accepted the offer of the Cleveland and Durham E.P. Co. for E.L. in the district. The Council is to pay £240, the cost of a separate lighting main, and as this will also benefit the company, the Council is to receive 90,000 units free.

Continental Notes.—GERMANY.—The Heiligenstadt R.D.C. has concluded an agreement with the Siemens-Schuckert Werke for a supply of electricity in the district.

The Berlin suburb of Gross-Lichterfelde has just made a new agreement with the Berliner Vororts-Elektricitätswerke A.G., by which for 30 years the company is to supply energy to the municipality at 0·84d. per unit for the first million units, 0·78d. for the second million, and 0·66d. above two million. The municipality determines selling prices and receives consumers' payments, but the company retains the ownership and management of the plant and mains, subject to a purchase clause regarding the latter.

The city of Hamburg has also rearranged its relations with the semi-municipal Hamburgische Elektricitätswerke in such a way as to secure a more powerful control and more advantageous purchase rights.

After many months of discussion in committee, the Berlin Municipality has now commenced public discussion concerning the future of the Berliner Elektricitätswerke. The concession is certain not to be renewed to the A.E.G. in its present form, but the comparative merits of municipal purchase and financial participation are being debated vigorously.

FINLAND.—It is claimed for the central electric lighting station which has recently been completed in the town of Wiborg, that it is the largest so far equipped with steam engines and boilers of the semi-portable type. The plant comprises three boilers and three sets of 500-650-H.P. steam engines, the latter being coupled direct to 380-KW. A.E.G. alternators. The plant is also interesting in that it is employed as an auxiliary to a hydro-electric power station near Wiborg.

AUSTRIA.—An hydro-electric undertaking is projected on the Mengbach, near Nenzing, on the Vorarlberg. It will have a capacity of 12,000 H.P., and will supply electricity to the municipal stations at Feldkirch and Bludenz, and also to Messrs. Jenny and Schindler. The cost of the undertaking is put at 4,000,000 kronen.

The Buda-Pesth T.C. has bought the plant, &c., of the Ungarische Allgemeinen Elektricitäts Gesellschaft for 21,757,000 kronen, and that company now ceases to exist.

One of the largest undertakings of its kind in Austria is stated to be about to be constructed at Marchegg, in Lower Austria. The great central station there projected will have a distribution network extending from the River March to Stockerau, a distance of about 20 miles.

Darfield.—FIRE.—Hundreds of patent electric safety lamps, charging plant, and electric motors, valued at between £1,000 and £2,000, were destroyed by fire at the Houghton Main Colliery last week.

Exeter.—YEAR'S WORKING.—The receipts of the Corporation electricity undertaking for the past year amounted to £19,544, an increase of £1,343 compared with the previous year. The working expenses were £11,605. Interest, income-tax and sinking fund charges absorbed £6,502, leaving a net balance of £1,446. The total output increased by 150,011 units, or nearly 10 per cent., and the energy sold for power and lighting increased by 17½ per cent. Coal cost £600 more than in the preceding year. All expenditure in connection with the old power station is now wiped out, and the assets in connection with it, including land, buildings, boilers, mains, &c., are valued at from £3,500 to £4,000.

Frinton-on-Sea.—SUPPLY TO BEACH HUTS.—The U.D.C. has sealed a contract with the E.L. Co. for lighting St. Mary's Road, as an experiment. The Council has also consented to the company supplying energy to the huts on the Sea Wall Promenade by overhead wires for lighting and heating, on condition that the company provides a lamp on alternate poles free of charge.

Great Harwood.—PROPOSED E.L.—The Trades Council has appointed a committee to consider the question of an E.L. scheme for the town, with a view of obtaining an extension of the U.D.C.'s prov. order, which expires in August.

Hull.—ANNUAL REPORT.—The report of the borough electrical engineer, Mr. H Bell, on the last year's working of the undertaking, states that the gross income had risen, chiefly owing to the development of power supply, from £75,291 to £82,813, and the average price had dropped from 1·62d. to 1·52d. per unit. The working expenses had been £47,256, an increase of £6,798 over the previous year, 32 per cent. of which was due to the increased cost of coal. £5,354 was carried forward. The units sold numbered 12½ millions, an increase of 16½ per cent. The present total plant capacity was 11,800 KW. The contract with Earle's Engineering and Shipbuilding Co., which took approximately 750 H.P., has been extended for a further five years. Bulk agreements had been entered into with other leading firms. The mains had been extended by 7½ miles, and the total is now 237 miles.

Huddersfield.—NEW MAINS.—The Electricity Committee has authorised the electricity mains to be extended to Bankfield Mills, Lockwood Brewery, the Rent Ley Silk Co., Newsome Chapel, Outlane, and the workhouse.

Irvine.—E.L. SCHEME.—The T.C. has decided to take a supply of electricity for the burgh from the Kilmarnock T.C., the charges to be the same as are in force in Kilmarnock. The Irvine T.C. is to have the option of purchase at the end of 21 years.

Java.—According to *La Gazetta de Hollande*, it is proposed to introduce electric power into the tin mines. The idea is to extend a power station now building for the Banka Mines at Klabath Bay, and transmit H.T. supply to various districts.

Lees (near Oldham).—Proposed E.L.—The U.D.C. has decided to confer with the Springhead U.D.C. on the question of a joint application to the Oldham T.C. for terms for a supply of electricity.

London.—Stepney.—Proposed Loan.—Application is to be made to the L.C.C. for sanction to borrow £3,000 for electricity services.

The Electricity Committee has purchased an electric delivery van from Opel Motors, Ltd., at £185.

Woolwich.—According to the *Financial News*, the B. of T. has sanctioned an arrangement whereby the municipal electricity undertaking proposes to join two companies in the matter of bulk supply.

The L.C.C. has refused to accede to the request of a conference of Metropolitan Borough Councils, to summon a general conference of local authorities in London owning electricity undertakings, to consider the question of the maximum period for the repayment of loans granted by the Council for electricity purposes. On behalf of the Finance Committee, it was stated that the present moment was most inopportune for calling a conference, because at no distant date it was anticipated that the Special Electricity Committee of the Council would report on the whole subject of London electricity.

Fulham.—There was a surplus of £8,220 on the past year's working of the B.C.'s electricity undertaking, from which the E.L. Committee proposes to transfer £5,000 to the reserve account, and to retain £3,226 as a working balance.

Lye (Stourbridge).—Proposed E.L.—The U.D.C. has appointed a Sub-Committee to consider the question of E.L. in the district, and the terms of an agreement with the Midland Electric Corporation for Power Distribution.

Maidenhead.—The T.C. has offered to supply electricity to the workhouse laundry at 5d. per unit for lighting and 1½d. for power, the latter to be increased to 2d. for current used between sunset and 10 p.m.

Luton.—L.G.B. Inquiry.—An inquiry was held on Monday into the application of the T.C. for a loan of £4,500 for extensions to the refuse destructor.

Middlesbrough.—Year's Working.—The gross profit on the Corporation electricity department for the past year amounted to £11,741, compared with £11,113 in the previous year, and the net profit was £3,814, against £3,369. The average price per unit was 1·68d., against 1·76d.

The T.C. is about to sign an agreement to take over the powers to supply North Ormesby.

Morecambe.—Promenade Lighting.—The borough electrical engineer is to be asked to prepare a scheme for illuminating the seafront in September, and the Corporation will be asked to supply current free.

The E.L. Committee has decided to renew the economiser at a cost of £300.

Mutford and Lothingland.—Workhouse Lighting.—The B. of G. has appointed a Committee to consider the lighting of the workhouse.

Oldham.—The Electricity Committee has decided to order additional machinery for the purpose of increasing the A.C. supply of power for factory driving, &c., at an estimated cost of £40,000, and the chairman has been deputed to interview the makers of machinery, with the object of securing the best terms.

Ormskirk.—Proposed Loan.—The B. of G. has decided to apply to the L.G.B. for sanction to borrow £823, for electricity purposes.

Rawtenstall.—Theatre Lighting.—The T.C. has decided that picture house and theatre occupants with weekly accounts be allowed a discount of 10 per cent. from their electricity accounts, provided the same are paid within five days.

Rugby.—Year's Working.—The total revenue of the U.D.C.'s electricity department for the past year amounted to £5,892, and the expenditure to £3,661. The net profit was about £800. Nearly 400,000 units were sold during the year.

The charges for energy for power have been amended as follows:—Less than 100 units per quarter per H.P. installed, 2d. per unit; between 100 and 200 units, 1½d. per unit; between 200 and 400 units, 1¼d. per unit; above 400 units, 1d. per unit.

Saffron Walden.—Proposed E.L.—The T.C. has appointed a Committee to consider the question of introducing E.L. into the town.

Sevenoaks.—The U.D.C. has decided to have the E.L. installed at the baths, and the E.L. Co. has offered to lay a free service cable on the Council undertaking to take current for five years.

Shrewsbury.—Year's Working.—The total income of the Corporation electricity department for the year ended March 31st last was £8,577, and the expenditure £4,823. After payment of interest on loans, £1,004, and sinking fund charges, £2,622, the net surplus was £128, against £95 in the previous year.

Southend-on-Sea.—Proposed Supply to Sanatorium.—Having been asked by the Middlesex C.C. upon what terms it would supply electricity to the Sanatorium which it is proposed to erect near Eastwood, the T.C. has agreed, subject to B. of T. sanction, to supply the institution on the C.C. consenting to pay 12½ per cent. per annum interest for ten years on the capital outlay, in addition to the usual charges; or, should the C.C. install a battery, the charge for energy would be 1½d. per unit between 6 a.m. and 6 p.m., and 6d. per unit between 6 p.m. and 6 a.m., in addition to the interest. The cost of the mains to the Sanatorium is estimated at £3,750.

The T.C. has decided, as a preliminary measure, to lay E.L. mains in 22 thoroughfares in Leigh, as required.

The Council has also decided to light the exterior of the Pier Hill Buildings, with 14 100-C.P. metal-filament lamps.

St. Margaret's (Kent).—The chairman of the P.C. has interviewed the B. of T. respecting the control of Dover T.C. on the question of a supply of electricity, and he reports that the Council can only obtain release from the control upon Dover agreeing to it, or the Corporation not having carried out its contract. Dover would not grant the release, and he was informed that it had carried out the undertaking given, as it was not obliged to supply St. Margaret's, the undertaking being to install cables in a certain number of streets. The chairman adds that the B. of T. official informed him that if the new company proposed to supply St. Margaret's, and went to the B. of T., the latter would support it, unless Dover agreed to complete its obligations without further delay.

United States.—The new hydro-electric installation of the Parr Shoals Power Co., carried out by the J. G. White Engineering Co., New York, has been started up. The power house is fireproof, and the present installation comprises five units, which will generate 18,000 H.P., while provision has been made for the eventual development of about 30,000 H.P. Energy is to be transmitted to Columbia at 60,000 volts, over a double circuit, steel-tower transmission line.

Walsall.—L.G.B. Inquiry.—An inquiry was held last week by Mr. T. C. Ekin, into the application of the T.C. for sanction to a loan of £74,830, for electricity purposes. The application was supported by several manufacturers in the town, and opposed by the Chamber of Commerce and the Tradesmen's Association.

Whitehaven.—The T.C. has decided to wire houses for E.L. where the tenants are owners, and to supply energy in such cases at 5½d. per unit, instead of 4½d., until the cost of wiring has been met.

Current is to be supplied for new lamps to be erected by the Harbour Commissioners, and consideration is to be given to a tariff for the domestic use of electricity.

TRAMWAY and RAILWAY NOTES.

Bury.—Goods on Tramways.—The Tramways Committee has instructed the manager, Mr. W. Clough, to prepare a scheme for the conveyance of goods on the tramways in Bury and district.

Continental Notes.—Austria.—The building section of the Austrian State Railways Administration has applied for sanction to the erection of a hydro-electric installation on the Mur River. Six 1,450-H.P. twin Francis turbines, a 250-H.P. exciter turbine, and a pump accumulator plant are to be installed.

India.—The concluding portion of Messrs. Merz and McLellan's report on the electrification of the E.B.S.R. suburban lines, proposes four lines from Calcutta to Naihati, and two from Naihati to Kanchrapara. Overhead conductors are recommended in place of a third rail, owing to trespassing on the lines, and the abolition of the intermediate class is proposed. A power station is suggested at Barrackpore, and the cost will be greatly cheapened if the E.I. Railway electrify concurrently and immediately their suburban line to Bandel. The principal object of electrifying the Eastern Bengal suburban lines is a financial one, and the consulting engineers report that it will pay to electrify them, as the gross capital outlay required for the scheme will be £904,855, and the annual saving in train operation alone is reckoned at £82,000, in spite of higher speeds of trains and of the better train service proposed. If it were decided to erect their own power station, the capital expenditure proposed above would be increased by £332,000, and the total gain by electrification would be £105,000. The investigation has shown that for the suburban scheme the direct-current system is the most suitable.

Liverpool.—Proposed 'Bus Service.—A recommendation of the Tramways Committee that several new motor-omnibuses be purchased has been referred back by the T.C.

London.—The G.N. Railway and Metropolitan Railway Bill, authorising the promoters to form a joint Committee to work the Great Northern and City line, to make junctions at Finsbury Park and the Bank, &c., has been withdrawn by the promoters.

Mexboro'.—Proposed Extensions.—The Mexboro' and Swinton Light Railways Co. has forwarded to the U.D.C. details of the overhead equipment of the proposed extensions, with an intimation that it proposes to commence construction.

Newport (Mon.).—Year's Working.—The past year's working of the Corporation tramway department has resulted, subject to audit, in a loss of £2,637, as against £2,326 in the previous year.

Walthamstow.—Proposed Loan.—The Light Railways Committee has recommended the U.D.C. to apply to the B. of T. for power to borrow £2,839, for the purpose of doubling the tramway track in Chingford Road. The Finance Committee is of opinion that provision should also be made for a loop near the Mark House terminus, and is recommending accordingly.

TELEGRAPH and TELEPHONE NOTES.

Argentina.—The Government will spend £4,400 on the erection of two wireless telegraph stations at Posadas and Puerto Aguirre.—*Board of Trade Journal.*

Australia.—A reduction has been made in the charges for telegrams transmitted from ships trading only in Australasia to shore addresses by wireless, from 10d. per word plus the usual inland rates, to a definite rate of 6d. per word, inclusive, without a minimum charge.

China.—It is reported that a contract between the Chinese Government and the Marconi Wireless Telegraph Co., amounting to £2,000,000, for the erection of eight high-power stations and a number of smaller ones, will shortly be signed. The Marconi Co. will receive for 25 years a royalty of 15 per cent. upon the receipts from all the stations.

France.—An article in *La Lumière Electrique*, of June 20th, describes very fully the development of wireless telegraphy in the French Colonies, and the projected inter-Colonial network which will connect them with the Motherland. Already 35 stations are in operation or in course of construction, and 27 are to be erected, in addition to the future long-distance chain.

Germany.—Wireless messages have been exchanged between Nauen and Windhuk, in German South-West Africa, over a distance of 7,000 miles.

Imperial Communications.—In a letter addressed to Mr. Hobhouse, Sir J. H. Heaton suggests the appointment of an Imperial Postmaster-General, to control all postal and telegraphic business affecting the Empire as a whole, and advocates the provision of an Imperial telegraphic service at low rates.

Norway.—In June last year the Storthing voted a sum of about £1,110,000 for the establishment of wireless communication between Norway and the United States. The transmitting station in Norway is now being erected in Ullenhaug, near Stavanger, on the west coast. Three-phase alternating current will be supplied by the town power station. The receiving station is being erected at Noerbö, about 17 miles south of Stavanger. The works are all on an extensive scale, and when completed the two stations will, it is claimed, be the largest of their kind in the world. On the American side, the transmitting and receiving stations will be near Boston.

Russia.—A wireless station has been opened on the Island of Waigatz, belonging to the Government of Archangel, in the Arctic Ocean.

Submarine Wireless Telephony.—Successful experiments were recently carried out at Boston by the Submarine Signal Co., with apparatus devised by Prof. R. A. Fessenden for telephoning between vessels ten miles apart.

Telephonic Ninepins.—Under this heading, the *Standard* says that a furniture van at Brighton on Friday last collided with a cast-iron standard carrying telephone wires. The standard snapped at the bottom and fell. The strain of the wires and the weight of the standard brought down 17 other standards in quick succession. The local telephone service was disorganised and the trunk lines to London were interrupted.

Trunk Telephone Calls.—In future no charge will be made for ineffective calls on the British trunk lines.

Wireless Direction Finder.—The R.M.S. *Royal George* has been fitted with the Marconi-Bellini-Tosi apparatus, which, in the thickest weather and without the aid of the compass or sextant, will enable her to find her position when she is within a radius of 50 miles of a fixed wireless station, or one on board a ship whose position is known. Also, should she pick up the wireless distress signal on this apparatus, she will be able to set her course towards its source, even though the ship in distress has not been able to give her position. A set of this apparatus, installed by the Marconi Co. on the R.M.S. *Eskimo*, plying between Hull and Christiania, has given very satisfactory results.

CONTRACTS OPEN and CLOSED.

OPEN.

Alford.—June 27th. Public lighting, for the U.D.C. Mr. T. N. Loy, Clerk.

Australia.—Sydney.—August 31st. Sydney Harbour Trust. Four electrically-operated semi-portable travelling cranes. Forms of tender from Mr. H. F. Norrie, Secretary to the Trust, Sydney.

Perth.—August 5th. Copper wire and binders, for Postmaster-General. See "Official Notices" to-day.

August 5th. Telephone instruments and parts. Telegraph accumulators and power board, Kalgoorlie, for Postmaster-General. See "Official Notices" to-day.

August 12th. Cable, lead-covered and various, for Postmaster General. See "Official Notices" to-day.

August 12th. Insulators, for Postmaster-General. See "Official Notices" June 12th.

August 19th. Electric lamps and fittings, for Postmaster-General. See "Official Notices" to-day.

August 19th. Telephone switchboards, galvanised iron and steel stranded wire, for Postmaster-General. See "Official Notices" to-day.

Melbourne.—July 6th. Rotary converters and frequency changers, for Melbourne Suburban Railways. See "Official Notices" June 5th.

July 6th. Electrically-operated car-shed cranes for Melbourne Suburban Railways. See "Official Notices" June 12th.

Aylesbury.—July 6th. U.D.C. Lighting and power switchboard with connections, battery of accumulators, underground mains, including house services, conversion of existing lamp standards, &c. See "Official Notices" June 12th.

Ballaghadereen.—July 6th. Hydraulic turbine and accessories, dynamo and reducer set, aerial line and switchgear, for the Electricity Committee. See "Official Notices" June 19th.

Blackburn.—June 26th. Electric light installation at the Ragged School. Specifications, &c., from Mr. J. Chilman.

Blackrock.—July 13th. U.D.C. Underground mains, overhead mains, feeder pillars and public lighting. See "Official Notices" to-day.

Bolton.—July 19th. Corporation. Converting plant, sub-station E.H.T. and H.T. switchgear. See "Official Notices" June 12th.

Canada.—July 1st. For the Esteven (Sask.) T.C. Two 250-KW. three-phase generators and exciters; one 500-KW. three-phase generator and exciter; three gas engines, complete with tar and dust extractors, and one switchboard. Particulars from Mr. L. G. Dethridge, Borough Electrical Engineer. Tenders to Mr. P. J. Stephens, Borough Secretary and Treasurer.

Canterbury.—June 29th. 1,800 tons small coal, and 400 tons first-class Admiralty large Welsh, for the Corporation Electricity Works. Mr. Henry Fielding, Town Clerk.

Exminster.—June 29th. Electrical appliances for a year for the Devon County Lunatic Asylum. Mr. H. E. Morgan, Clerk.

Fleetwood.—July 2nd. U.D.C. Electricity Department. Moderately rough coal for 12 months. Mr. A. Cottam, Clerk, Town Hall, Fleetwood.

France.—Paris.—July 7th. The French State Railway authorities (Bureaux du Service Electrique, 3e Division) in Paris (72, Rue de Rome) are inviting tenders for the supply of 2,599 electric rail connections, 7,600 m. of bare copper cable of a section of 200 sq mm., and 1,600 m. ditto of a section of 400 sq. mm.

Lille.—July 3rd. Cable and sundry electric equipment for the pumping station on the La Bassée River. Particulars of the Maire, Hôtel de Ville, Lille.

Seine.—The State Railway Administration (42, Rue de Châteaudun) will shortly place orders for: Lot 2, 12 travelling cranes, with electric gear, for the new machine shops at Sotteville; Lot 3, 12 bogie-truck railway carriages, divided into first and second-class compartments; Lot 4, 20 twin-spring bogie-truck automotor carriages and 10 trailers. Particulars, 44, Rue de Rome, Paris.

Keymer (Sussex).—June 27th. Public lighting, for the P.C. Mr. H. Plummer, Clerk, Lyntonville, Hayward's Heath.

Leeds. — July 6th. Tramways Committee. Six hundred waterproof overcoats. Mr. J. B. Hamilton, Manager.

June 29th. Corporation. Air-cooled transformers. See "Official Notices" May 22nd.

London.—L.C.C. June 30th. 150 sets plough collector gear. See "Official Notices" June 12th.

July 13th. One, two or three electrically-driven chassis, for Fire Brigade. See "Official Notices" June 19th.

July 14th. Five rotary converters of 1,500 KW. each, 15 main static transformers, two starting static transformers, and re-erection, &c., of existing motor generators. See "Official Notices" June 19th.

July 30th. 10,000 or 5,000 driving and pony wheel tramcar tires, 300 axle forgings for tramcars. Chief Officer, Tramways Department, 62, Finsbury Pavement, E.C.

H.M. OFFICE OF WORKS.—June 30th. Wiring public offices extension, Westminster, S.W. See "Official Notices" June 12th.

July 1st. Twelve months' supply of incandescent electric lamps. See "Official Notices" June 19th.

July 7th. Three years' supply of electrical accessories. See "Official Notices" June 19th.

HACKNEY.—July 9th. B.C. 80,000 pairs open-type white arc lamp carbons, and 100,000 pairs yellow-flame arc lamp carbons. See "Official Notices" to-day.

Manchester.—June 26th. Corporation. Potential and current transformers, C.C. and A.C. motors, electricity meters, C.C. motor-starting switches, and three-phase star-delta switches. See "Official Notices" June 12th.

June 30th. Education Committee. Electric light installation at the Mill Street Day Industrial Schools. Specifications, &c. (21s., returnable), from the Education Offices, Deansgate.

New Zealand.—AUCKLAND.—August 6th. Three 750-KW. D.C. mixed-pressure turbo-generators; one 1,500-KW. three-phase turbo-generator, including auxiliary plant and sub-station equipment. See "Official Notices" May 22nd.

July 31st. Seventy three-phase A.C. motors, including four 150-B.H.P., one 100-B.H.P., and eight 75-B.H.P., for the Dominion Portland Cement Co. Specifications from E. W. Hunt, secretary, Johnston Street, Wellington, or S. I. Crookes, Consulting Engineer, Auckland. —*N.Z. Shipping and Commerce.*

Particulars may be seen at the Commercial Intelligence Branch of the Board of Trade in London.

Pittington (Durham).—July 11th. Poles, lamps, cables, &c., for the Parish Council. Specification from Mr. T. Carson, Clerk.

Ramsey (Hunts).—July 6th. Public lighting, for the U.D.C.; Mr. R. F. Serjeant, Clerk.

Rochdale.—July 1st. Corporation. Wet-air filter. See "Official Notices" June 19th.

Rochester.—June 30th. Corporation. Electric lighting of the Corn Exchange Buildings. See "Official Notices" June 19th.

Roscrea (Ireland).—July 2nd. B. of G. Wiring and fittings for workhouse lighting. Specification from Mr. L. J. Lawless, 27, Castlewood Avenue, Dublin.

Rotherham.—July 8th. Corporation. Tramway stores, coals, cables, meters, &c. See "Official Notices" June 19th.

Salford.—June 26th. Corporation. Switchboard for the docks sub-station. Specification from the Borough Electrical Engineer, Electricity Works, Frederick Road, Pendleton.

Skelton and Brotton.—July 2nd. U.D.C. Overhead lines, underground cables, transformers, sub-station equipment, public lighting fittings. See "Official Notices" June 12th.

Stalybridge.—June 27th. 12 months' supply of stores for the Joint Tramways and Electricity Board. Specifications and form of tender obtainable from Mr. R. Blackmore, Engineer-in-Chief, Generating Station, Stalybridge.

Stoke-on-Trent.—Corporation. Twelve months' supply of coal and slack for the Electricity Supply Department. Specification from the Chief Electrical Engineer, St. Peter's Chambers.

Thorne (Yorks.)—July 6th. Public lighting, for the P.C. Mr. C. Waller, Clerk.

Walsall.—July 14th. Corporation. Four water-tube boilers, superheaters, economisers, pumps, pipes, &c. See "Official Notices" June 19th.

July 14th. Corporation. Two 3,000-KW. turbo-alternators with surface condensers, motor generator. See "Official Notices" June 19th.

Warrington.—July 3rd. Electric equipment, &c., for transporter bridge over the River Mersey, for Jos. Crosfield & Sons, Ltd. Drawings, &c. (£2 2s.) from Mr. W. H. Hunter, M.I.C.E., 42, Spring Gardens, Manchester.

July 8th. Corporation. High and low-tension cable. See "Official Notices" to-day.

West Ham.—July 20th. Lighting installation at Rosetta Road School, for Education Committee. See "Official Notices" to-day.

CLOSED.

Australia.—The Sydney Council has received the following tenders:—

Bare copper cable.—Standard Cable Mfg. Co., £2,120; B.I. & Helsby Cables, Ltd., £2,212; W. T. Henley's Telegraph Works Co., Ltd., £2,407.

Underground cable (11,000 volts).—Western Electric Co., Ltd., £10,120; Noyes Bros., £10,845; Australian Metal Co., Ltd., £10,760; Australian Metal Co., Ltd. (alternative), £8,225; Siemens Bros., £10,600; B.I. and Helsby Cables, Ltd., £11,082; W. T. Henley's Telegraph Works Co., Ltd., £11,389; N. Gutteridge, Ltd., £11,606.

—*Australasian Record.*

Belgium.—Seven concerns—four German, two Belgian and one French—submitted tenders last week to the municipal authorities of Antwerp, for the supply of a quantity of armoured cables for the new dry dock at the port of Antwerp. The lowest offer was that of the Hoddernheimer Kupferwerk und Suddeutscher Kabelwerk Gesellschaft.

Devonport.—The Corporation has made a contract with the British Thomson-Houston Co., Ltd., for 12 months' supply of continuous-current mercury ampere-hour meters.

Elland.—In connection with the erection of a new church for the trustees of the Southgate United Methodist Church, the tender of Mr. F. Horsfall (£440), for the lighting and heating, &c., of the building has been accepted.

Glasgow.—The T.C.'s Tramways Committee has recommended acceptance of the following tenders:—

Brass tubing.—Joseph Evans & Co., Ltd.
Copper bonds.—B.I. & Helsby Cables, Ltd.
Special trackwork.—Lorain Steel Co.
Insulated stud bolts.—Fleming, Birkby & Goodall, Ltd., and W. C. Yuille and Co., Ltd.
Three-way lighting switches.—W. McGeoch & Co.
Solid rubber tires.—Shrewsbury & Challiner Tyre Co., Ltd.

Hastings.—The T.C. on June 19th accepted the tender of Messrs. Oliver Arc Lamp, Ltd., for 100,000 pairs of carbons for Oriflamme arc lamps, at £290.

Hindley.—The U.D.C. has accepted the tender of the B.I. and Helsby Cables, Ltd., for cables, cast-iron joint boxes, and cast-iron feeder pillars, at £1,007.

Huddersfield.—The managers of Kirkheaton National School have accepted the tender of Mr. T. W. Broadbent for installing electric light.

The Tramways Committee has accepted the tender of the B.I. and Helsby Cables, Ltd., for the supply of one mile of 2/0 hard-drawn (round) copper trolley wire; and has made a contract with the United Electric Car Co., Ltd., for 14 top-deck covers for cars.

Hull.—Messrs. Clark & Graham, of Hull, have been appointed to supply electrical goods, &c., to the Board of Guardians during the new six months.

Leeds.—The Corporation Sub-Tramways and Electric Committee has accepted the tender of Messrs. Appleyard Bros. for the construction of a transformer chamber at the premises of the Kirkby Banks Screw Co., Ltd., Beeston, for £190.

Lerwick.—Messrs. Mackenzie & Moncur have secured the contract for the heating installation, the hot-water supply, and the electric lighting, of the new hostel at Lerwick.

London.—L.C.C.—The Highways Committee reports having arranged during the Whitsuntide recess for the motor generators at the Lewisham sub-station, to be repaired by Siemens Bros. Dynamo Works, Ltd., at a cost of £147.

The Committee reports the acceptance of Messrs. J. Williamson and Co., for the supply, during 1914-15, of cast-iron plough shoes for the tramway department.

The Main Drainage Committee reports the receipt of the following tenders for electrical resistance indicators for recording temperatures with the superheaters attached to the new boilers at the Crossness pumping station.

Leskole Co., Ltd.	(recommended)	£77
R. W. Paul	.. .. ..	105
,, ...	(alternative)	112

ST. PANCRAS.—The Electricity Committee recommends that the tender of Messrs. J. H. Beattie & Co., Ltd., be accepted for the supply of the following coal for a year:—2,100 tons of Baddesley beans at 15s. 2d. per ton, 12,000 tons of Newdigate screened beans at 14s. 3d. per ton, and 6,000 tons of Newdigate large double-screened nuts at 16s. per ton, for the King's Road generating station; and 8,000 tons of Haunchwood hard steam coal at 17s. 6d. per ton, for the Regent's Park generating station.

STEPNEY.—The Electricity Supply Committee recommends the acceptance of the following tenders for the supply of coal and coke for the Electricity Department:—

Messrs. M. Abbott & Co., 150 chaldrons of broken coke at 10s. 9d. per chaldron and 700 chaldron of unbroken coke at 9s. 9d. per chaldron; Mr. C. Franklin, 200 tons of London made small coal at 15s. 9d. per ton; Messrs. J. Hudson & Co., Ltd., 350 tons of Welsh Colliery small (Rheola) coal at 17s. 10d. per ton and 25 tons of Tanfields (Smiths) South Hetton coal at 21s. 9d. per ton; Messrs. Sargeant, Longstaff and Co., 200 tons of Sharleston Wallsend coal, 25s. 9d. per ton; Spenser, Whatley, Ltd., 550 tons of Griff 2 yd. hard large coal at 21s. per ton; 200 tons of Newdigate nut slack (through 3) nutty small coal at 12s. per ton.

The Committee reports the receipt of the following tenders for the supply of meters, demand indicators and time switches for the period ending June 30th, 1917.

FOR METERS.	2½ to 25 amps.	50 to 100 amps.
Bastian Meter Co.	*£362	—
Bat Meter Co., Ltd.	900	†£275
B.T.H. Co., Ltd.	871	*268
British Westinghouse E. & M. Co.	†591	†292
Ditto (alt)	1037	†292
Chamberlain & Hookham, Ltd.	*512	292
Electrical Co., Ltd.	680	*285
Electrical Apparatus Co.	*497	†250
Ferranti	967	292
G.E. Co, Ltd.	687	306
Isaria, Ltd.	770	†262
Landis & Gyr, Ltd.	671	315
Reason Manufacturing Co., Ltd.	657	*275
Siemens Bros. Dynamo Works, Ltd.	670	301

Demand Indicators, 2½ to 100 amps.—B.I. & Helsby Cables, Ltd., †£570; Reason Manufacturing Co., Ltd., £800.

Combined Meters and Demand Indicators, 200 to 750 amps.—G.E. Co., Ltd., £807; Landis & Gyr, Ltd, †£292; Reason Manufacturing Co., Ltd., £369; Siemens Bros. Dynamo Works, Ltd., £339.

Time Switches.—Ferranti, Ltd., †‡£281; W. Geipel & Co., £702; Landis and Gyr, Ltd., *†£151; Reason Manufacturing Co., £734; Venner Time Switches, Ltd., £658.

* Not to specification. † No sample submitted.
‡ 10-amp. size only tendered for.

The Committee recommends the acceptance of the tenders of Messrs. Chamberlain & Hookham, Ltd., for the supply of meters of 50 to 100 amps.; the G.E. Co., Ltd., for combined meters and demand indicators 200 to 750 amps.; the Reason Manufacturing Co., for meters 2½ to 25 amps., and for demand indicators 2½ to 100 amps.; the Venner Time Switches Ltd., for time switches.

For the supply of carbons for 12 months the following tenders were received:—

	White arc carbons.	Flame arc carbons.	Total.
Henrion Carbons	£486	£330	£816
W. Geipel & Co.	580	328	908
Ship Carbons, Ltd.	Will not accept contract for white arc carbons only.	384	946
Siemens Bros. Dynamo Works, Ltd.	645	324	969
Electrical Co., Ltd.	624	353	977
Sloan Electrical Co., Ltd.	509	496	1,005
W. Geipel & Co. (alt.)	695	328	1,023
G.E. Co., Ltd.	677	486	1,163
Crompton & Co., Ltd.	562	614	1,176
H. Tuchman	506	No tender received for flame carbons.	506

The Committee recommends that the tender of Messrs. Siemens Bros. Dynamo Works, Ltd., for flame arc carbons be accepted, and that of the Sloan Electrical Co., Ltd., for white arc carbons.

Messrs. Siemens Bros. Dynamo Works, Ltd., have obtained a contract from the Royal Mail Steam Packet Co., for the supply of metal-filament lamps, which includes tantalum lamps for ship lighting and Wotan lamps for office lighting, both at London and Southampton, for the ensuing 12 months.

Lossiemouth.—The T.C. has accepted the tender of Messrs. Primrose & Primrose, for installing electric light in the Town Hall and public library.

Mexborough.—The U.D.C. has accepted the tender of Messrs. J. H. Tucker for 50 sets of consumers' main fuses, at 6s. 2d. per set.

Sevenoaks.—Messrs. S. Young & Son have had orders placed for wiring of New Beacon Schools, Sevenoaks; "Howdale," Oxted; and "Mount Harry," Sevenoaks.

Southend-on-Sea.—The T.C. has accepted the tender of Messrs. Edgar Allen & Co., Ltd., of Sheffield, for a curve for the tramways in Southchurch Avenue, at £296.

Wallasey.—Messrs. Chamberlain & Hookham have received the contract for A.C. meters for this town.

Walthamstow.—The U.D.C. Finance Committee has accepted the tender of Messrs. W. T. Henley's Telegraph Works, Ltd., at £678, for cable and jointing; also that of the Albion Clay Co., Ltd., at £309, for stoneware conduits.

THE ELECTRICAL ENGINEERS
(LONDON DIVISION).

Commanding Officer—LIEUT.-COL. H. M. LEAF.

The following orders have been issued:—

Friday, June 26th.—"D" Company. Infantry drill, 7.30 to 8.30 p.m. Technical instruction, 8.45 to 10 p.m.

Saturday, June 27th.—Main body for Berehaven Camp will parade at headquarters at 12 noon. Regimental business will be transacted till 12 noon.

Monday, June 28th, and to a date in October which will be notified later, headquarters will be closed for drill purposes.

Headquarters will be opened daily for the transaction of regimental business from 10 a.m. till 4 p.m., except Saturdays, on which days the opening will be from 10 a.m. till 12 noon. Headquarters will be closed for all purposes on August 3rd and 4th, 1914.

(Signed) F. R. HOLT-WHITE, Capt. R.E., Adjutant,
For Officer commanding L.E.E.

FORTHCOMING EVENTS.

Batti-Wallahs' Society.—Saturday, June 27th. River trip.

North of England Institute of Mining and Mechanical Engineers.—Saturday, June 27th. Visit to Home Office Experimental Station at Eskmeals.

Wireless Society of London.—Tuesday, June 30th. At 8 p.m. At Institution of Electrical Engineers, Victoria Embankment. Paper on "The Production of Continuous Waves by High-Frequency Dynamo Machines," by Mr. Basil Binyon.

Institution of Municipal Engineers.—Friday and Saturday, July 3rd and 4th. North-Western District meeting at Manchester.

NOTES.

The American Society for Electrical Development.—The Society for Electrical Development held its second annual meeting on June 1st at the Bellevue-Stratford Hotel, Philadelphia, Pa. Mr. J. M. Wakeman, general manager of the Society, reported that the funds necessary to begin active work had been pledged, and that the best men available to carry on the work had been secured. This work has been divided into sections as follows:—Field co-operation, new development, commercial exchange bureau, and editorial and advertising. The activities of the Society are well under way, directed by the following staff:—

Mr. George Barton Muldaur, M.E., is in charge of the work of the first section, and Mr. Robert N. Lee has been engaged to assist him. Mr. Muldaur will travel about the country forming co-operative leagues for more intensive local development of the industry, aiding architects and builders to arrange for complete electric service instead of lighting alone, bringing text-books and lecture courses up-to-date, &c. Mr. John P. Mallett, E.E., will investigate the present uses of electricity in the various industries and report how these applications can be extended. Mr. Theodore Dwight, who is in charge of the commercial exchange bureau, will secure and index information regarding the use of electricity. This information will be at the service of the members of the Society. The news and advertising department is in charge of Mr. H. C. Spaulding. Mr. L. G. Harkness-Smith has been placed in charge of a department which will aim to illustrate by means of motion pictures the uses of electricity in the home, mill, factory and farm. A window-trimming department has also been organised and placed under the supervision of Mr. A. J. Edgell. Sample electrical displays are being set up in windows and photographs taken and distributed among the members of the Society. Printed instructions on how to trim the windows are sent with the illustrations.

Mr. Wakeman further reported that the society membership consisted of 298 central stations, 186 manufacturers, 272 jobbers and dealers, 588 contractors, and 23 miscellaneous industries. He said that the Society was still desirous of increasing its membership in order that the development work may be made more extensive.

Mr. James Smieton, jun., acting treasurer of the Society, then presented his report.

The following members of the board of directors were elected to represent the central stations:—Messrs. J. E. Montague, Niagara Falls, N.Y.; manufacturers, H. B. Crouse, Syracuse, N.Y.; jobbers and dealers, Fred. Bissell, Toledo, O.; and contractors, G. M. Sanborn, Indianapolis, Ind.; each to serve four years.

At the meeting of the board of directors which followed, this resolution was unanimously adopted: "The Society's efforts shall be devoted to developing the use of electrical energy by the general public, thus increasing the market of all engaged in the industry, leaving the question of defining the channels through which, and methods by which, the present and increased market shall be reached, to experience and local co-operation."

A resolution was also adopted to the effect that, "Any member whose semi-annual subscription becomes seven months in arrears shall be dropped from membership in the Society."

The following officers were elected to serve for the ensuing year:—President, Henry L. Doherty; first vice-president, W. H. Johnson; second vice-president, A. W. Burchard; third vice-president, W. E. Robertson; fourth vice-president, J. R. Crouse; fifth vice-president, Ernest Freeman; general manager, J. M. Wakeman; acting secretary-treasurer, James Smieton, jun. The following were elected to serve as the Executive Committee during the ensuing year:—H. L. Doherty, Ernest Freeman, A. W. Burchard, J. R. Strong, Gerard Swope, L. A. Osborne, W. E. Robertson, J. R. Crouse and W. H. Johnson. Mr. Johnson was elected chairman of the Executive Committee.

Appointments Vacant.—Assistant telegraph engineer (£400), for Gold Coast Government; assistant storekeeper (£21 month) for Shanghai Municipal Electricity Department; switchboard attendant (26s. week) for Cleckheaton U.D.C.

Inquiry.—Makers of "Cleveland" accumulators are asked for.

Radium.—The Sheffield Radium Committee has entered into a contract for the purchase of half a gramme of radium; £8,989 has been raised towards meeting the cost.

The National Physical Laboratory. — On Friday last the annual meeting of the General Board was held at Teddington; Sir Wm. Crookes, P.R.S., chairman of the Board, presided, and was supported by Lord Rayleigh (chairman of the Executive Committee), Dr. A. Schuster (hon. secretary), Sir A. B. Kempe (hon. treasurer, Royal Society), and Dr. R. T. Glazebrook, director of the Laboratory.

The report and accounts for the year 1913 14 were presented and approved. Owing to a change in the financial year of the Laboratory, which now ends on March 31st, the report covered 15 months' work. The deaths of Sir Wm. White, Mr. R. Kaye Gray, and Sir David Gill were recorded with deep regret; Sir Archibald Geikie and Sir Arthur Rücker had retired, and Sir Francis Hopwood had been appointed to a seat on the Board. The report stated that owing to the great increase in the work of the Laboratory since its establishment in 1901, and the heavy financial liability incurred by the Royal Society in its management, steps had been taken by the Board and supported by the technical societies concerned, with a view to enabling the Royal Society to prepare a new scheme of organisation for submission to the Treasury.

Great progress had been made in the work and equipment of the Laboratory during the year. Time signals were received daily from the Eiffel Tower and Norddeich, as well as from Greenwich. The value of the goods sent for test approached £300,000. Since December last about 115 mgm. of radium had been certified. Numerous additions had been made to the staff, and the Committee felt that in order to maintain the high quality of the work the salaries of the senior members ought to be increased. Work had been carried out for numerous Governmental Departments, Colonial Governments and engineering institutions. Mr. F. E. Smith's research on the absolute measurement of the standard of electrical resistance had been completed, the result being accurate to about four parts in 100,000, and representing a marked advance on anything previously achieved; Mr. Smith found that the International Ohm = $1{\cdot}00052 \times 10^9$ C.G.S. units of resistance, or that the length of the column of mercury which represented the true ohm should be 106·245 cm., instead of 106·300.

In view of the pending electrification of the London and South-Western Railway through Teddington, and the statutory requirement that the magnetic disturbances produced thereby at the Laboratory should not exceed the present value by more than 20 per cent., recording magnetometers had been set up in a building in the garden at some distance from the Laboratory by Mr. Smith. Mr. Campbell's work on the measurement of inductance and capacity at the high frequencies employed in wireless telegraphy had made satisfactory progress, as well as the measurement of the power conveyed by high-frequency currents, and researches in magnetisation under large magnetising forces. Mr. Paterson and Mr. Rayner had developed improved instruments for the measurement of large alternating currents, and Mr. Melsom had investigated the conductivity of steel rails for the Engineering Standards Committee, and the heating of buried cables for the I.E.E. Important researches in other departments had also been carried out.

During the year 1913-14 (12 months) 259 electrical apparatus had been tested in the Physics Department, and 3,828 in the Electrotechnics Department—the latter comparing with 2,512 in 1912; of these, 774 tests related to ammeters, 838 to voltmeters, 517 to shunts, 469 to dielectric strength, and 414 to supply meters. Thermometer tests numbered over 28,000.

During the year 1913-14 the income rose from £32,058 to £43,713, about 36 per cent. Expenditure increased from £32 479 to £40,968, including £2,339 extraordinary capital expenditure. Salaries and wages amounted to £28.407, compared with £24,436. The year ended with a balance of £2,745 to credit; in 1912 there was a deficit of £420. There was a debt of £2,661 on the Tank Building Fund, to the reduction of which part of the balance would be applied.

Annual Outings.—The works and offices of the Western Electric Co., Ltd, will be closed to-morrow, Saturday, June 27th, as the annual outing is taking place to Clacton-on-Sea.

Last Saturday week the staffs of the office and works of the Clyde Valley Electrical Co. went for their annual trip to Kilchattan Bay.

The members of the electrical staff at Crewe works, for their outing to Liverpool, went by train to Ellesmere Port, where they boarded a steamer and sailed down the Manchester Ship Canal and the Mersey. Upon arrival at Liverpool, the party inspected the ss. *Baltic*, which was lying in Canada Dock, and after tea various places of interest in and about the city were visited. A resolution of thanks was passed to Mr. Ernest Bull for his work in arranging the outing.

Scottish Tramway Managers' Conference.—Representatives from Glasgow, Dundee, Leith, Falkirk, Kirkcaldy, Dumbarton, Paisley, Ayr, Dunfermline, Wemyss and Perth, attended the annual conference at Perth, when Mr. F. Coutts, Paisley, presided. On the opening day the representatives were entertained to luncheon by the Lord Provost, and later motored to Bridge of Earn, where Mr. Snell, manager of the Perth Corporation Tramways, entertained the visitors to tea. The papers read at the Conference dealt with the motor-'bus and roads and tramway tracks. Mr. Snell gave interesting details regarding the Perth Corporation motor-'bus scheme, expressing the opinion that the motor-'buses had a great future before them as feeders for tramways, and were far before the railless trolley system. He did not go the length of saying that the motor-'bus would ever oust the electric tramway but there was no doubt that it was a competitor.

Liverpool Electricians' Strike.—Our Liverpool correspondent writes:—"Some 400 electricians employed by about 50 local firms are out on strike in Liverpool. The men failed to turn in to work on Monday, following a resolution passed at a mass meeting of the Electrical Trades Union, held on Sunday night. This drastic action has been taken in reply to the employers who notified them of a reduction of ½d. per hour in the rate of wages. The following is the notice which was posted in all the workshops in the city by the masters:—'Owing to no signed rules being in operation between the Master Builders' Association and the Electrical Trades Union, the wages of all Union wiremen will be reduced in accordance with the notice sent by the Master Builders' Association to the Electrical Trades Union. All wiremen's wages will be reduced by ½d. per hour as and from Saturday, the 20th inst.'

"In December last the men received an advance from 9d. to 9½d. per hour, and almost immediately afterwards they put forth fresh demands, including a 1s. an hour wages, a decrease of 3½ hours, 1s. per day extra for dirty work, and 1s. 6d. extra per day for cold storage (E.T.U. delegate to decide the definition of rules *re* dirty work). An alteration of each of the 15 rules then in operation was sought. Under the old rules deputations to employers were to consist of six working tradesmen, but the new demands provided for six delegates of the E.T.U. in place of men directly concerned, while on the Board of Conciliation four E.T.U. representatives were to be substituted for operatives. Among the other demands submitted was one providing for three months' notice, instead of six months from either side for alteration of rules, which meant that during the progress of any large job, the men might demand more wages, with a consequent loss to the employer.

"The employers could not see their way to grant the fresh demands, but no action was taken by the men's Union when the notice expired on June 1st, and the employers were unable to obtain any satisfaction from the men's Union as to what steps they proposed to take.

"The masters had no desire to reduce the men's wages, but they felt that it was the only course by which the employés could be forced to reconsider the situation and sign the agreement embodying the working rules which had just expired.

"It is important to point out that if the men's demands were conceded, Liverpool firms would be placed at a considerable disadvantage when competing with Manchester firms for country contracts. The men in Manchester are paid 9½d. per hour, and the rate of pay in London even is only 10½d. The demand of the Liverpool men for 1s. per hour if granted, would represent an increase approximately of 10s. 6d. per week on their present wages. If the men sign an agreement embracing the old working rules under which they would get 9½d. an hour, as in Manchester, it is understood that the employers would be agreeable.

"At the present time business is not over brisk in the electrical trade in Liverpool, but work is not completely at a standstill, a considerable number of men still remaining at work."

Notes from the Rand.—Our Johannesburg correspondent writes:—The third annual mining exhibition, promoted by the Chemical, Metallurgical and Mining Society, was opened on May 19th, in the Johannesburg Drill Hall. In one sense it is the most important yet held, the Society on the present occasion having directed its efforts towards imparting a much-needed fillip to the "Safety First" movement. In 1913, there were 2,315 accidents in the Rand Mines, involving 808 deaths, and injuries to 2,005 persons, and some detailed reference may be made to the award of the first and second prizes (£25 and silver medal, and £15 respectively), which have been made by the Rand Mutual Assurance Co., for exhibits in the "Safety First" section. The first prize has gone to Mr. A. Nowag, of Modderfontein, for a safety clip "for the prevention of misfires due to the pulling out of fuse and detonator from the primer." Mr. W. A. Lindberg, of the Ferreira Deep G.M. Co. was the winner of the second prize, with a device for preventing the over-winding of electric hoists. It has been designed to prevent over-winding accidents when hoisting either men or rock. There are three principal parts, viz.:—(1) Electrical contacts in the head-gear for rock hoisting. (2) Electrical contacts above the collar of the shaft for men hoisting. (3) A three-point controller operated by the hoist driver. When the "men" or "rock" contacts are operated by the skip, or cage, the main switch to the winder is opened by a no-volt coil, and the post-brakes are automatically applied. When rock is being hoisted, a lever on the controller is placed on the "rock" position, and then only the contacts in the head-gear are in circuit. When the signal is given to raise men, the driver places the controller lever to the "men" position, and (what is most important) he cannot give the return bell signal until he has done so. The plunger of the contacts at the collar of the shaft is pulled out at once by a solenoid acted upon by the controller lever when on the "men" position. On the resumption of rock hoisting, the first skip passing the plunger pushes it back out of reach of succeeding skips, saving wear. Should an over-wind take place when the controller lever is in either the "rock" or "men" position, the driver cannot start his motor until the handle of the controller is brought to the "off" position. A bell then rings until the skip has been moved from the danger point. The advantages of the device are that the contacts are operated directly by the skip, which is independent of stretching of ropes, faulty indicators, &c., and is therefore applicable to "whiting" hoists, as well as drum hoists. It is understood that four sets have been in successful operation since February, 1913.

(*Continued on page* 1079.)

THE KING'S BIRTHDAY HONOURS LIST.

In the list of birthday honours published on Monday morning last, two well-known electrical men figure.

Knighthoods have been conferred in both cases, and we offer our hearty congratulations to Sir John F. C. Snell, the well-known consulting engineer, and to Sir Albert H. Stanley, managing director of the "Underground."

Sir John Snell.

As the former of these is president-elect of the Institution of Electrical Engineers, the honour comes as one of especial interest at the present moment. Sir John took a very prominent part in the arbitration proceedings connected with the purchase by the Government of the undertaking of the National Telephone Co. He was not only the principal witness for the Post Office, being in the box for 12 or 14 days, but he shouldered the bulk of the preparation of the case on that side. It will be remembered that the award showed a saving of many millions sterling to the State, and it is understood that for his services rendered in this connection the present honour has been bestowed upon Mr. Snell. It had been expected that others who played an important part in connection with the same proceedings would also have appeared in the list, but for some reason or other they are not so rewarded. Honours are not always so swift in falling as has happened in Sir John's case; they are overdue in several directions.

Keith Dannatt] [*Woking.*

Sir John Snell,
Pres.-Elect I.E.E.

Sir John Snell, when he takes up the reins of office at the Institution of Electrical Engineers, will do so as a man in his early prime, for he is only 45 years of age. In view of recent events, the reader may wonder whether he will have a "policy," but we have no authority for making any suggestions of any kind in that connection, unless such be conveyed by the knowledge which we have that he was disappointed at the collapse of the Industrial Committee. He has some experience of the needs of local sections, for he was at one time chairman of the Newcastle Section. For five or six years he has occupied a seat on the Council. He was also, when in the north-east district, vice-president of the local section of the Institution of Civil Engineers. Sir John is chairman of the Electrical Section of the Engineering Standards Committee.

During his period of office as city electrical engineer at Sunderland, he was responsible for the building up of a big electric supply industrial load, and he was a recognised authority on the engineering side of electricity supply. Two standard books have been produced under his authorship, namely, "Distribution of Electrical Energy," and "Power House Design" (1911). He left municipal service at Sunderland in 1906, and began consulting practice in Caxton House, Westminster, on January 1st, 1907, among other connections secured being the Buenos Ayres and Pacific Railway, for the electrical work of which he has been responsible, including the Bahia Blanca power house. He had earlier been retained by the London County Council in connection with one of the schemes for electricity supply, indeed, it was really his interest in this matter that induced him to come South. On the death of Major Cardew, as a result of arrangements entered into with Mr. Arthur Preece the subject of these notes became a partner in the firm of Preece, Cardew & Snell in September, 1910. His personal contribution to the operations of that firm is concerned with heavy power work, generating stations, and so forth, but he devotes himself principally to giving expert evidence and advising in a consultative capacity many municipal Corporations. Recently he was retained by the Bristol Corporation in connection with its Tramways Bill, and he is now acting similarly in connection with the Belfast Corporation extensions. He has further lately rendered assistance in the form of evidence to the London County Council in respect of its present electric supply problem.

Sir Albert Stanley.

Sir Albert H. Stanley is the managing director of that great network of lines of electric railways and motor-omnibuses owned and controlled by the Underground Electric Railways Co., and the London General Omnibus Co.

He has undoubtedly played a very important part in the consolidation of these various interests which has helped greatly in the better organisation of London traffic and relieved to some extent the congestion and want of co-ordination that formerly existed. He is managing director of the Underground Electric Railways Co. of London, and of the Metropolitan District Railway, the London Electric Railway Co., the Central London and City and South London Railways. He is also a director of the London United Tramways and the London and Suburban Traction Co., Ltd. Sir Albert, who is only 39 years of age, prior to his taking control of these vast undertakings in London, was for some 12 years general manager of leading American electric railways. He is, however, an Englishman by birth—a native of Derby.

OTHER HONOURS.

Others whose names appear in the list are :—Sir J. W. Benn (L.C.C. Progressives' Leader) who is promoted from knighthood to be a baronet ; Mr. D. M. Stevenson, of Glasgow, also one of the seven new baronets, if we remember aright, had much to do with municipal telephony in Glasgow ; Mr. T. K. Rose, D.Sc., chemist and assayer to the Royal Mint for the past 12 years, is made a knight ; Mr. Richard Meredith, Director of Telegraphs, Indian Telegraph Department, is appointed C.I.E.

The Hon. Adam Beck, who receives the honour of Knight Bachelor, is chairman of the Hydro-Electric Power Commission of Ontario. He is described in the Press as "Minister without portfolio of the Province of Ontario."

The Hon. G. E. Foster, Minister of Trade and Commerce, Canada, and Lieut.-Col. G. L. Eyles, M.Inst.C.E., Consulting Engineer for Railways to the Crown Agents for the Colonies, both appear in the Colonial Office List with promotions to K.C.M.G. In the Indian List, Mr. W. Gunnell Wood, A.M.I.C.E., Chief Engineer and Secretary to the Government in the United Provinces Public Works Department, becomes a C.S.I., and Mr. P. Glynn Messent, M.I.C.E., chief engineer to the Bombay Port Trust, and Mr. R. H. Tickell, M.I.C.E., Chief Engineer to the Public Works Department, Central Provinces, are both given the C.I.E., as is also Mr. Thomas Summers, M.I.C.E., late of the Bombay Public Works Department.

Pirie MacDonald] SIR ALBERT STANLEY. *[New York.*

We do not think that any electrical or engineering student of this year's list of honours will feel that the Government has been generous in its recognition of the great work which engineers, electrical and otherwise, and sc'entific men, are doing in the world to-day. Political leaders are strangely blind to the claims of men of merit, achievement and world-wide repute in these departments of profession and industry.

A SMOKE INDICATOR.

WRITING on the subject of a novel form of smoke indicator, the *Electrician* welcomes the appointment of a Departmental Committee by the Local Government Board, with a view to investigating the smoke question and getting together sufficient evidence to enable it to make such regulations as shall tend to the abatement of smoke.

It is suggested that two factors must be given due weight in any consideration of the subject : the one, whether a smoke producer is too heavily penalised financially if compelled to abate smoke to below the "black" line ; the other, the provision of means to measure blackness.

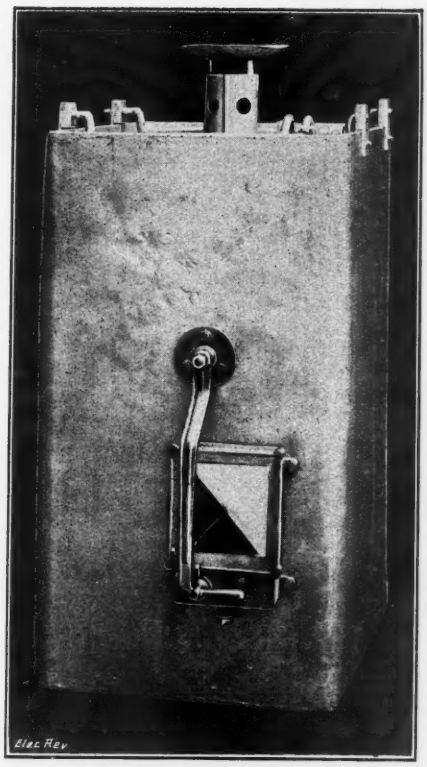
Now blackness is not at all a term of a precise order, for upon the thickness of the stream of smoke depends its apparent depth of colour. So there is no real measure of dirtiness : and the only objection to black smoke is its dirtiness. The blackness of smoke may be abolished, and we shall be brighter and happier, but the atmosphere will be very little better. Our limestone buildings will all go white, and St. Paul's will look beautiful, but it will continue to melt away in the form of sulphate, for the worst constituent of coal smoke will still exist until such time as coal for power is burned only at a distance from the town, and gas for heating purposes is desulphurised. Meantime let us welcome everything calculated to clear away the blackness if it can be shown to be practicable. Prof. Strong, in the United States, has paid much attention to smoke, and has devised an instrument to indicate its presence in a boiler flue. Clean flue gases are strongly ionised, but when smoke is present or dust or fume, the particles of these combine with the ions, leaving the flue gas ionised but slightly. Thus with a spark-gap in the flue, in parallel with two other spark-gaps under ordinary atmospheric conditions, if an alternating pressure is applied to the gaps by means of a transformer, and the gap in the flue is set so as to take the discharge when the gas is normal, then when smoke is present, the gas resistance becomes greater and the discharge passes by the two gaps in parallel. The conductor between the two parallel gaps is connected to earth through a coherer, which operates a relay and rings a bell or otherwise signals that there is smoke in the flue. The invention sounds interesting, and might be useful at night or in a fog. Not that a chimney top cannot usually be seen well at night, but in a fog chimney tops cannot be seen even by the inspector unless he goes up a high building, whence he may often see them standing above the fog, or the smoke from a buried chimney coming up into the clear above the top surface of the fog layer. The smoke indicator described would take notice of the presence of smoke in the flue, and indicate to the engineer whether his men were taking advantage of fog to relax their efforts.

The appointment of a committee is stimulating interest in the subject, but it is unfortunate that there is no money in the smoke question for the genuine man. Patentees of a hundred times patented articles may make money if, having some rig-out to sell, they have the eloquence to sell it with. The steam user is frequently a gullible creature. He cannot distinguish wheat from chaff, and so he will buy a ton of cast-iron one day and a load of fireclay goods next day, and he knows at least he has bought something, material and gross—even if he pays pounds for stuff worth as many shillings. But he will never pay cash for technical advice. Technical advice weighs nothing, and is to him valueless. And so smoke experts degenerate into humbugs, for they become panderers to ignorance in the way that our modern Douster-Swivels pander to the same sort of ignorance with their twig-twiddling antics in place of rational hydro-geology.

SELF-ACTING FIRE ALARMS AND EXTINGUISHERS.

[BY OUR BERLIN CORRESPONDENT.]

An ingenious combination of self-acting fire alarms and extinguishers has been recently designed by Messrs. Siemens Bros., in conjunction with some affiliated Continental firms. The new scheme is intended to indicate by electrical means



Automatic Fire Extinguisher.

any dangerous increase in temperature, and to put out automatically any incipient fire by the action of carbonic acid. It is especially suitable for rooms containing substances subject to spontaneous combustion, such as storage rooms for oil, petroleum, dyes, &c., powder sheds, ammunition compartments, coal bunkers, as well as libraries, archives, &c., containing valuable manuscripts and other documents liable to be destroyed by water or steam.

The scheme comprises two parts, viz., the apparatus for generating carbonic acid, and the electrical installation consisting of a number of self-acting fire alarms with indicators, checking instruments and batteries.

The carbonic acid generator, which is installed in the room to be protected, is a galvanised sheet-iron vessel, the dimensions of which depend on the size of the room.

This vessel is provided with a lid carrying a small turret-shaped fitting for discharging the carbonic acid and intercepting any solution carried along by the latter. The vessel contains a wrought-iron tank free to rotate round an axis which carries, outside the vessel, a lever which in the position of rest is kept vertical by a pawl, retained by the armature of an electromagnet and disengaged by attracting the armature, thus allowing the tank to tilt under the action of gravity.

The outside vessel contains, up to about one-third of its height, a solution of potash, while the inside tank is filled with concentrated sulphuric acid.

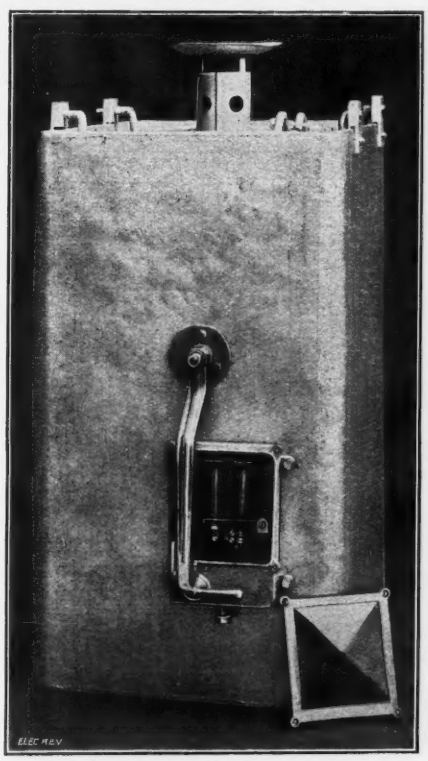
On the tank tilting, the acid is allowed to flow out through small holes, falling into the potash solution and thus developing within 25-30 seconds 5,000-15,000 litres of carbonic acid (in accordance with the size of the apparatus), which is thrown into the surrounding atmosphere by a pressure of 7 or 8 lb. per sq. in. The efficiency of the apparatus is not impaired even by some years' interval in working.

The electrical part of the installation comprises the self-acting fire alarm and the indicator. The fire alarm mainly consists of a bent double metal strip composed of two metals of different rates of expansion rolled upon one another at very high pressure so as to be intimately united. Any undue increase in temperature will result in the metal strip being unbent, thus lifting the contact of the alarm. A graduated scale allows the fire alarm to be adjusted to operate at any temperature between 35° and 100° C.

In accordance with modern practice the plant is worked with closed-circuit current. The indicator is a switchboard comprising any instruments required for checking the plant and a proper number of alarm bells. By a special arrangement of connections the accidental operation of the carbonic acid generator in case of rupture of some conductor is effectually prevented, only an alarm signal being actuated.

In order to prevent the carbonic acid generator from being set working whilst a man is present in the room, a switch attached to the door cuts out the disengaging magnet of the carbonic acid generator as soon as the room is entered by anybody. The arrangement of connections can also be designed for the apparatus to be disengaged by hand through push buttons situated outside the room.

The installation above described can, if desired, be equipped with a preliminary alarm worked at a given



Cover Removed, showing Electromagnet.

increase in the temperature of the room to be protected (*e.g.*, at 45° C.) without actuating the extinguisher, which is disengaged only at some higher temperature (*e.g.*, 70° C.).

Tests made at the Royal Testing Office by the Hanover and Kiel fire brigades and on board a vessel of the German Navy have given excellent results, latent as well as open fires being put out with remarkable rapidity.

THE I.M.E.A. VISIT TO WARWICK CASTLE.

On Thursday, June 18th, after luncheon at Stratford-on-Avon, the members of the Incorporated Municipal Electrical Association went by motor-vehicles to Warwick Castle. Prior to the inspection of the Castle and grounds, the party assembled on the lawn for the taking of the official photograph. Copies of the photograph (18 in. × 13 in.) may be obtained from the studio of Mr. J. W. Beaufort, Easy Row, Birmingham, for a few shillings.

NOTES.

(*Continued from page* 1074.)

Electric Vehicle Demonstration.—A demonstration of electric vehicles was held by the Richmond (Surrey) Electric Light and Power Co. on the 18th inst. in the premises adjacent to the supply station. A number of tradesmen attended, and a very complete demonstration was given of the great advantages of the electrically-propelled vehicle for trade purposes—charging, handling and trial running of the vehicles being shown to the visitors. The company look forward to doing considerable business in this direction in view of the facilities they can offer, and are actively pushing the matter by demonstrations and general advertising.

Storms in the Provinces.—The atmospheric disturbances mentioned in our last issue were followed by similar outbursts in various districts.

On Wednesday last week in the North-west of England and the North of Ireland lightning discharges and rain, said to be the worst experienced for many years, damaged much property, and the electric tramway service in several towns was temporarily suspended, while telephones and telegraphs were interrupted.

On Thursday the Midlands were visited by a violent storm; a hospital at Hanley was struck by lightning and electric lighting wires were fused, but no serious results were recorded. Many other buildings were struck, and a carter was killed, as well as two horses that he was driving. At Swindon the tramway service was interrupted. On the same day a storm occurred near Dalkeith, and telephonic communication between Edinburgh and Newton Grange was cut off.

Further disturbances took place on Friday, in Essex, Notts. and in the London district, accompanied by two fatalities.

Educational Notes.—The annual meeting of the Society for the Promotion of Engineering Education has been held at Princeton, N.Y., U.S.A., this week; many papers on the teaching of engineering subjects, and on college administration, were to be read and discussed. Particulars can be had from the Secretary, Mr. H. H. Norris, Ithaca, N.Y.

University of London.—The Drapers' Company has resolved to bear the cost of the new chemical laboratories of the East London College, amounting to about £15,000.

On Tuesday a conversazione was held at University College, Gower Street, to celebrate the erection of the new buildings of the School of Architecture, in which are now combined the schools of both University College and King's College at the cost of an anonymous donor. The building is the largest and most complete of its kind in the United Kingdom. H.R.H. Prince Arthur of Connaught, President of the University College Equipment and Endowment Fund, visited the new buildings, and was received by the Vice-Chancellor, Sir Wilmot P. Herringham, and other prominent supporters and officers of the Colleges. Lecturettes and a few demonstrations were given, and music was provided; a large number of visitors were present. We venture to suggest that on such an occasion the ample resources of the laboratories should be drawn upon for the entertainment of the guests; in the physics and electrical engineering departments in particular there would be no difficulty in organising spectacular demonstrations of the greatest interest and fascination, especially to the uninitiated visitors. Apart from the reception of wireless signals and a demonstration of vibrating strings by Prof. Fleming, and the breaking of a few samples in testing machines by Prof. Coker, for a short period only, practically nothing of this kind was attempted.

Institution and Lecture Notes.—N.E. Coast Institution of Engineers and Shipbuilders.—From July 7th to 10th the Summer Meeting of the Institution of Naval Architects, the Institution of Engineers and Shipbuilders in Scotland, and the N.E. Coast Institution, will be held at Newcastle-upon-Tyne. Very complete arrangements have been made by the last-named Institution for the comfort and entertainment of their colleagues, and an interesting programme of receptions, papers and visits to engineering works has been organised. Provision has been made for the entertainment of ladies by a strong Ladies' Committee. Judging from the wealth of attractions offered in the official programme, the occasion will be a memorable one, and should be thoroughly enjoyed by all who take part in it.

American Institute of Electrical Engineers.—This week the Annual Convention of the Institute has been in progress at Detroit, Mich., U.S.A.

National Association of Goldsmiths.—At the annual conference at Margate last week, Mr. F. Hope-Jones, M.I.E.E., delivered a lecture on electric clocks before the leading representatives of the watch and clockmaking trade. He pointed out that electric time service had been established in spite of the clockmaking trade, and not with their assistance, and complained that they knew little of the subject, and had been habitually pushing electric clocks away with both hands, whilst on the Continent electric time service had been an active part of their profession and a subject of study in their horological schools for a generation. An interesting discussion followed, in which these strictures were answered by the leading men of the profession, and the proceedings closed with a spirited reply from Mr. Hope-Jones, pointing out that the loss of key-winding contracts was not to be regretted, because they were replaced by more remunerative supervision contracts, and that the prejudice aroused by past failures had now been killed in the minds of all fair-thinking men.

Fatality.—Through being caught between two wheels of the electric haulage at Redford Pit, Muiravonside, Falkirk, George Erskine (24), a machineman, sustained fatal injuries.

Ordeal by Fire and Water.—Two 10-H.P. squirrel-cage induction motors recently gave a convincing proof of their sturdy qualities at the works of Messrs. Samuel Wheeler & Sons, Ltd., Smethwick. They were employed to drive a number of machines, and were mounted on beams in the roof of the building. A fire broke out in the roof, and a large portion covering two bays was destroyed before the outbreak was finally mastered. Although the motors were not actually in the fire, the roof truss on one side of them was totally destroyed, and that on the other side was badly charred. On the arrival of the fire brigade a steady stream of water was therefore directed upon the motors, and, as these were of the ordinary protected type, the windings received a severe drenching. Half an hour later, when the fire was finally subdued, it was found that although the motors were thoroughly drenched and had been subjected for half an hour to the action of the smoke and steam emitted from the burning roof when the hose was played on it, they started up quite satisfactorily when the current was switched on. The two machines, which were manufactured by the British Thomson-Houston Co., Ltd., nearly two years ago, had given no trouble whatever before the outbreak of fire, and still continue to give satisfaction.

Holidays.—The works of the British Westinghouse Electric and Manufacturing Co., Ltd., at Trafford Park, will be closed from 5.30 p.m. on Friday, July 24th, until 7 a.m. on Tuesday, August 4th, 1914, for the annual holidays.

Mechanical Stokers at Southend.—In our article on the Niclausse boilers at Southend-on-Sea, published in our issue of May 15th, the legend under the illustration on p. 813 stated that the stokers were of the Bennis type. This was an error; as stated in the article, Niclausse stokers were used; they are of the "Britnic" type, and are unlike any stoker that is made in this country. We regret the mistake.

The Telectrograph.—On Wednesday a demonstration was given of the "Telectrograph," an instrument developed by Mr. Thorne Baker and Captain Otto Fulton for the transmission of photographs by wire for the Press, at a cost which is said to be a small fraction of that incurred a few years ago. The apparatus has at present a working range of 800 miles, and is being introduced by the Photo Telegraph and Cable Co.

Late Legal.—Osram Lamp Works, Ltd., *v.* Pope's Electric Lamp Co., Ltd.—This case came before the Court of Appeal, composed of Lords Justices Swinfen Eady and Pickford, on Wednesday, upon the appeal of the plaintiffs from a decision of Mr. Justice Joyce, declining to give the plaintiffs leave to deliver an interrogatory in a form disputed by the defendants.

Mr. Colefax, K.C., and Mr. J. Hunter Gray appeared in support of the appeal; and Mr. T. Terrell, K.C., and Mr. Russell Clarke for the respondents.

Mr. Colefax explained that the plaintiffs brought the action against the defendants for the alleged infringement of one of their patents relating to metal-filament lamps. The lamp concerned was a built-up filament lamp which was made by taking a compound of tungsten and mixing it with a binding organic medium, formed and carbonised. It was mixed with some organic substance to make a paste, and this was squirted through a hole of small diameter. Then it was heated so as to carbonise the organic matter, the result being the production of a filament which still contained a quantity of carbon, which was possibly under 1 per cent. Counsel stated that the plaintiffs objected to the form in which the learned Judge had allowed the interrogatory to be administered to the defendants. By that interrogatory the plaintiffs had not been allowed to ask the defendants what organic binding medium was used by the defendants. What the plaintiffs wanted was to be in the position to present their case properly when it came on for trial, and to enable their experts to investigate the process alleged to have been used by the defendants, and so prepare themselves for giving evidence at the trial.

Lord Justice Swinfen Eady: Do you allege that the defendants use the same process as yours?

Mr. Colefax said he did not go so far as that, but defendants admitted that they used an organic binding medium. Several other actions were pending. What the plaintiffs sought by the interrogatory was to ask the defendants what process they used for the purpose of removing the carbon from the filament. He submitted that in the circumstances the interrogatory which the plaintiffs sought to administer was neither a fishing interrogatory nor oppressive, and ought to be allowed in the form in which it had been drawn.

In the result, their Lordships, without calling upon counsel for the respondents, held that the appellants were not entitled to administer the interrogatory in the form in which it was drawn, but that they were entitled to ask the defendants whether or not they used the particular media used in the plaintiff's specification, and also whether the defendants in the removal of the carbon had used the plaintiffs' process. Appellants were not entitled to put to the defendants a fishing interrogatory as to the way they removed the carbon. With that variation the order of Mr. Justice Joyce would be affirmed and the appeal dismissed, the costs to be the defendants' in any event.

Marconi Litigation.—In the Chancery Division, before Mr. Justice Sargant, on Wednesday, in the action of Locker-Lampson

and Another *v.* Isaacs and Others, counsel for the plaintiffs made a preliminary objection, and said that it would be necessary to amend the statement of claim and join other defendants. The case, it will be remembered, relates to the bargains in American Marconis, and asks, on behalf of Marconi company shareholders, for a statement of profits made in these transactions. After a lengthy discussion, his Lordship took the view that further discovery should proceed, further particulars being given. He adjourned the summonses generally, with liberty to apply to restore and with leave to amend should the amended pleadings of the plaintiffs render such a course advisable.

On the same day the hearing of the action Marconi and Marconi's Wireless Telegraph Co. *v.* Helsby Wireless Telegraph Co., for infringement of the "four-sevens" patent—which has now expired by effluxion of time—came before Mr. Justice Eve in the Chancery Division. The infringement alleged was in connection with the supply of wireless installations to four ships for the L. & N.W. Railway Co.

OUR PERSONAL COLUMN.

The Editors invite electrical engineers, whether connected with the technical or the commercial side of the profession and industry, also electric tramway and railway officials, to keep readers of the ELECTRICAL REVIEW *posted as to their movements.*

Central Station Officials.—On Friday afternoon the staff and employés of the Corporation electricity department took their formal farewell of MR. A. S. BARNARD, the borough electrical engineer, who is severing his connection with the Walsall Corporation at the end of the present month. Advantage was taken of the occasion to express appreciation of the cordial relations which have existed between Mr. Barnard and the staff, and to present him with a suit case as a small memento and mark of esteem. Mr. Barnard was also asked to accept, on behalf of Mrs. Barnard, a silver rose bowl. The presentation was made by Mr. Cookson, and suitably acknowledged by Mr. Barnard.

The officials and staff of the Sheffield electric supply department have presented MR. H. A. HOWIE, deputy manager, who is leaving to become general manager and engineer of the electricity department at Walsall, with a silver tray and pipe.

MESSRS. FROST, SOWERBY and PADDEN have been engaged in the places of two charge engineers and one junior engineer, who have resigned their positions with the Willesden Council.

The Ilford Electricity Committee has recommended that the salary of MR. A. H. SHAW, chief engineer, be increased from £500 per annum to £525 as from April 1st last, and to £550 from April 1st, 1915.

The marriage took place on Saturday at St. Jude's Church, Bradford, of MR. W. J. TREVOR, of the electricity staff at Dunfermline, and formerly of the city electrical department at Bradford, and Miss Ivy Emily Dinsdale, youngest daughter of the late Mr. R. M. Dinsdale, Hanover Square, Bradford.

Tramway Officials.—During the present month MR. ANDREW NANCE, manager of the Belfast Corporation Tramways, celebrates his tramway jubilee. He began his work in connection with the tramway world in June, 1864, when he entered the offices of Messrs. Hood & Jacomb, railway engineers, of Westminster, who were then acting as engineers of the Landport and Southsea tramways. These were among the first tramways laid in the streets of a British town; the rails were of steel and were secured to longitudinal sleepers by counter-sunk screws. The system was subsequently taken over by the Portsmouth Street Tramways Co., of which Mr. Nance was one of the first directors. In 1881 he took over the management of the Belfast tramways under the old company, and he has seen the receipts rise from £14,500 to £272,000 per annum. When the Belfast system was transferred to the municipality ten years ago he continued his control, and has done so right down to the present time.

The Burton-on-Trent T.C. has increased the salary of MR. A. B. SLATER, tramways manager, from £200 to £225 per annum.

General.—MR. J. C. GREGG, who has for some years been principal traveller at Messrs. Falk, Stadelmann & Co.'s Glasgow branch—74, 76 and 78, Great Clyde Street—has been appointed manager in the place of Mr. Gustav Falk, who is leaving Glasgow to take up his position as director on the board of Falk, Stadelmann & Co., in London.

The marriage was to take place at St. Michael's Parish Church, Linlithgow, on Wednesday, June 24th, of MR. KENNETH ARTHUR MOUNTAIN, only son of Mr. W. C. Mountain, of Newcastle-on-Tyne, to Miss Nancy Miller, the only daughter of Mr. and Mrs. William Miller, Bonnytoun House, Linlithgow, formerly of Dishergam, Bengal, India.

MR. ERIC EATON, who has carried on business as an electrical engineer in Old Street, Ashton, has been appointed chief assistant engineer of the Woods Gilbert Rail Plane Co., London, for the British Isles.

While on a visit to South Devon, MR. HAROLD R. BURGESS, who is in the employ of the British Electric Transformer Co., was instrumental in rendering assistance to a bather who was in difficulties. Our correspondent says:—"Not knowing who Mr. Burgess was, the rescued gentleman, who was also a visitor, sent a postal order for £1 to the 'Torquay Directory' office, with a request that it should be forwarded to his rescuer, as a mark of appreciation of his timely aid."

Messrs. Bruce Peebles & Co., Ltd., have appointed MR. E. W. BROWNE as their Birmingham office manager in place of Mr. Hilton, who has resigned that position to take up other work. Mr. Browne has been connected with Messrs. Bruce Peebles & Co., Ltd., for many years, and is thoroughly familiar with their manufactures.

The Council of the London Chamber of Commerce on Friday last passed a vote of condolence with the directors of Ferranti, Ltd., and the relatives of the late Mr. A. B. Anderson, who just before his death had been elected a member of the Council.

Will.—The *Financial Times* states that MR. W. H. JOHNSON, of Altrincham, chairman and managing director of Richard Johnson, Clapham & Morris, Ltd., and chairman of Electromotors, Ltd., who died in February last, aged 64 years, left £65,022 gross and £57,620 net.

NEW COMPANIES REGISTERED.

S.A.C.J., Ltd. (136,464).—This company was registered on June 16th, with a capital of £15,000 in £1 shares, to acquire, work, develop and manufacture any form of combustion or turbine engines, &c. The subscribers (with one share each) are:—T. W. Doran, 4, Fernleigh Drive, Leigh-on-Sea, clerk; H. Jacques, Elstree Cottage, Victoria Road, Mill Hill, N.W., clerk. Private company. The number of directors is not to be less than two or more than five; the subscribers are to appoint the first. Solicitors: Ingle, Holmes, Sons & Pott, Capel House, E.C.

Kiesow & Co., Ltd. (136,457).—This company was registered on June 16th, with a capital of £15,000 in £1 shares, to take over the business of a vendor, agent and importer of glass and enamelware and lighting accessories carried on by R. Kiesow at 25, Fore Street Avenue, E.C., as "Kiesow & Co." The subscribers (with one share each) are:—R. Kiesow, 25, Fore Street Avenue, E.C., merchant; Miss H. M. B. Kiesow, Homewood, Bromley, Kent. Private company. R. Kiesow is first permanent managing director and chairman; qualification, £100. Registered office, 25, Fore Street Avenue, E.C.

Andcole & Turner, Ltd. (136,408).—This company was registered on June 15th, with a capital of £100 in £1 shares, to carry on all kinds of agency business, especially in regard to the electrical industry. The subscribers (with 33 shares each) are:—H. W. Anderton, 24, Oakhill Court, Putney, S.W., engineer; H. Coleman, 2, Cowley Mansions, Brixton, S.W., engineer; W. F. Turner, 75, Honeywell Road, Wandsworth Common, S.W., engineer. Private company. The first directors are H. W. Anderton, H. Coleman and W. F. Turner, each of whom may retain office while holding £30 shares; remuneration of permanent directors, £250 each per annum. Registered office, Queen Anne's Chambers, Westminster, S.W.

Autopins, Ltd. (136,439).—This company was registered on June 16th, with a capital of £2,000 in £1 shares, to carry on the business of manufacturers of and dealers in split or cotter pins, dealers in mechanical and electrochemical products and apparatus, and electric and mechanically-operated plant, &c. The subscribers (with one share each) are:—C. Bingham, 11, Queen Victoria Street, E.C., merchant; A. S. Young, 11, Queen Victoria Street, E.C., merchant. Private company. The first directors (to number not less than two or more than seven) are C. Bingham, W. B. Leashar and F. J. Underhill; no qualification necessary; remuneration as fixed by the company. Registered office, 222-3, Mansion House Chambers, 11, Queen Victoria Street, E.C.

R. Wolf, Ltd. (136,528).—This company was registered on on June 19th, with a capital of £5,000 in £1 shares, to carry on the business of engineers, boiler and steam engine makers, superheated steam locomotive, electrical, agricultural and general machinery manufacturers, iron-masters, steel makers and converters, &c. The subscribers (with one share each) are:—O. Schweitzer, 7, Laurence Pountney Hill, E.C., manager; J. B. Macfarlane, 7, Laurence Pountney Hill, E.C., Private company. The number of directors is not to be less than three or more than six; the first are Max Wolf, A. Reiche, F. Litzmann, H. Storck, O. Schweitzer, and J. B. Macfarlane: qualification, one share; remuneration (except managing director) as fixed by the company. Registered office, 7, Laurence Pountney Hill, E.C.

OFFICIAL RETURNS OF ELECTRICAL COMPANIES.

Electrical Engineering and Motor Co. (Carlisle), Ltd.—Debenture dated June 11th, 1914, to secure £500, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: W. L. A. Lamb, Clifton House, Newton Bar, Wakefield.

G. M. Wireless Patents Syndicate, Ltd.—Particulars of £3,000 debentures, created June 11th, 1914, filed pursuant to Sec. 93 (3) of the Companies' (Consolidation) Act, 1908, the amount of the present issue being £2,100. Property charged: The company's undertaking and property, present and future, including uncalled capital. No trustees.

Yorkshire Waste Heat Co., Ltd.—Trust deed, dated June 9th, 1914, supplemental to trust deed dated December 4th, 1912, modifying such original deed and providing for the issue of further deb. stock. The amount of stock secured by the original deed is £25,000. Trustees: F. J. Kitson and H. I. Bowring.

Christy Brothers & Co., Ltd.—Issue on May 20th, 1914, of £800 debs., part of a series of which particulars have already been filed.

Coatbridge & Airdrie Electric Supply Co., Ltd. (89,178).—Capital, £1,000 in £1 shares. Return dated March 26th, 1914; all shares taken up; £1,000 considered as paid. Mortgages and charges: £148,962 8s. 11d.

James Keith & Blackman Co., Ltd.—A memorandum of satisfaction in full on May 15th, 1914, of debs., dated October 29th, 1901, and June 8th, 1911, securing £475, has been filed.

Direct Spanish Telegraph Co., Ltd. (6,732).—Capital, £95,000 in 13,000 ord. and 6,000 pref. shares of £5 each. Return dated April 13th, 1914; 12,931 ord. and 6,000 pref. shares taken up; £94 655 paid. Mortgages and charges: £29,200 first mortgage debentures, redeemable June, 1914.

Ernest F. Moy, Ltd. (47,408).—Capital, £10,000 in £1 shares (8,500 ord. and 1,500 pref.); return dated April 17th, 1914; all shares taken up; £10,000 paid. Mortgages and charges: £1,450.

CITY NOTES.

Continental Electrical Companies.

THE *United Glow Lamp & Electricity Co., of Ujpest*, besides having had a larger turnover in 1913, reports having effected economies in manufacturing, the two circumstances resulting in a more favourable yield. After making an allocation to the depreciation fund the accounts show net profits amounting to £52,400 as compared with £47,900 in 1912. It is intended to pay a dividend of 12 per cent. as against 10½ per cent. in the previous year.

The report for 1913 of the *Austrian Siemens-Schuckert Works*, states that in consequence of the war in the Balkans there was a stagnation in the orders received in particular from the Near East. A more serious matter, however, was the standstill in the inland business in electric railways owing to the obscure general situation and the resulting lack of enterprise, whilst at the same time reserve was shown by domestic firms in proceeding with the adoption of new equipment in their works. The decline in one portion of the company's business was partly compensated by greater activity in overland central stations, which were affording increased work for the electrical industry. During the year the orders booked were about of the same value as in 1912 and the works were sufficiently provided with work for the greater portion of the period, the latter portion of the year indicating a fairly large reduction which still continues. The net profits are returned at £121,000 as against £94,900 in 1912, and a dividend of 7 per cent. is proposed on £1,333,000 as compared with the same rate on capital of £1,000,000 in 1912.

The report for 1913 of the *Ateliers de Constructions Electriques du Nord et de l'Est, of Paris*, which has an ordinary share capital of £1,200,000, states that all departments were very actively employed and the invoiced turnover amounted to approximately £1,120,000, or two and a half times more than in 1911. Notwithstanding the severe industrial and financial crisis prevailing at the present time (May 27, 1914), the company's books are well provided with orders and the future is regarded with confidence. Proceeding to refer to the heavy machinery workshops at Jeumont-Nord, the report mentions the completion during the year of turbo-alternators of 25,000 H.P. for the northern section of the Compagnie Parisienne de Distribution; of 15,000 KW. for the Nantes station; 16,500 KW. for Lille; and 20,000 KW. sets for Valenciennes-Anzin station. Apart from the construction of travellers for a lifting capacity of up to 250 tons, a crane of 250 tons for the Chantiers de la Loire, and cranes for Bordeaux, Nantes, Algiers and Bone, the traction department effected important deliveries of motors to the Paris Metropolitan Railway, the State railways in connection with the conversion of lines in the environs of Paris, and the Nantes tramways. The pig iron and steel founders were well provided with work, and furnished, among others, many castings for locomotives and the navy. The output of the cable department, which was equipped with improved machinery for the manufacture of high-tension cables, was very considerable; the rubber preparation factory was brought into operation; the insulating tubes branch was fully employed, and the copper rolling and drawing mills dealt with copper of the value of £340,000. The accounts show net profits amounting to £105,600 and the dividend declared is at the rate of 17 fcs. (13s. 7d.) per ordinary share.

The *Ateliers de Constructions Electriques de Charleroi, of Brussels*, reports gross profits amounting to £83,000 for 1913. After deducting £21,000 for depreciation there remain net profits of £62,000 on ordinary share capital of £795,000, permitting the payment of a dividend of 20 fcs. (16s.) per fully paid £10 share. According to the directors' report, the orders booked during 1913 represented over £1,000,000 as compared with £771,000 in 1912, and a further increase has taken place in the first four months of 1914 as contrasted with the corresponding period in last year; so that the works at Charleroi-Marcinelle and Charleroi-la-Villetta are at present in full operation. During the year numerous orders were received from the collieries where the company's winding-engines are highly appreciated, and from the iron and steel works to which were delivered, amongst others, cranes, hoists and blast-furnace charging apparatus. Turbo-alternators were ordered in large numbers for central stations, together with generating units of from 3,500 to 6,500 H.P. to be driven by gas engines; and the department for tramways and railways experienced a further development. An increase also took place in the customers for cables and numerous contracts were secured from different public authorities and supply companies. The company, in association with allied companies, participated in the formation of the Société Industrielle d'Électricité pour la Russie for the development of the supply business in Russia in Europe and Asiatic Russia, the share capital being £1,000,000; in the construction of the Société des Forges et Ateliers de La Longueville, which has a capital of £400,000 and which proposes to construct rolling stock for railways and tramways; and in the exploration work being carried out in the new coal basin in the centre of Hainaut.

Electricity Supply in Paris.—Since the Paris Secteurs, or district electric lighting undertakings, were merged into or brought under the control of the Compagnie Parisienne de Distribution d'Electricité a year or two ago, the latter has possessed a monopoly of electric supply in the French capital with the exception of the business transacted by the Société d' Electricité de Paris, which furnishes to the former from its large works at Saint Denis a considerable amount of energy pending the completion of the new generating station of the Compagnie Parisienne. When the latter is brought into operation, the first effect will be a decline in the supply provided by the Société d'Electricité in the case of this particular customer, and the company will probably only again be able to record a fresh upward movement when the Compagnie Parisienne is once more compelled to apply to external sources to assist in meeting the demand—a period which is considered to be not very remote, having regard to the rapid development of consumption in Paris. In the meantime the fact may be noted that the Société d'Electricité has experienced regular progression since the Saint Denis station was opened in 1905-06, when the number of kilowatt hours sold amounted to 11,960,000. This quantity had risen to 100,317,000 KW. hours in 1911-12, and to 125,390,000 KW. hours in 1912-13, and the dividends paid on the ordinary shares have gradually grown from 10s. per share in 1907-08 to 16s. per share in 1912-13. On the other hand the amount written off first establishment costs had reached £271,000 on June 30th, 1913, thus bringing this account down to slightly less than £1,000,000, whilst the sum of £202,000 had been set aside by the same date for the renewal of machinery and plant. The actual value of the securities in portfolio, which are included in the balance sheet at cost price, largely exceeds the amount of £672,000 at which they are entered, and the shares held in the Compagnie Parisienne alone showed an excess Stock Exchange value of £480,000 on April 30th, 1914, over the prices entered in the balance sheet. Besides supplying power to the Metropolitan Railway, the Compagnie des Omnibus and the Compagnie des Tramways de Paris, the Société d'Electricité has contracts of long duration in force in the neighbourhood of Paris, apparently for many industrial enterprises, and the success of the undertaking is claimed to have justified the promoters in proceeding with a scheme based upon the development of supply in the vicinity of the French capital.

A Swiss Electrometallurgical Reconstruction Scheme.—A drastic scheme of reconstruction is contemplated in the case of the Société Electrometallurgique Paul Girod, of Neuchatel, with the aid of the French firm of Schneider & Co., of Creusot. A year ago it was proposed to reduce the ordinary share capital from £480,000 to £288,000, and to issue preference shares for £192,000 and 5 per cent. bonds for £320,000, but the plan was apparently not carried into effect. According to a Zurich newspaper, it is now intended to reduce the share capital from £480,000 to £120,000, and then to raise it to £240,000 by the issue of new shares for £120,000, which are to be taken over by Schneider & Co., although existing shareholders will have the right to subscribe. It is, however, considered that the French firm, with its existing shareholding, will control the majority of the shares in the future. The head offices are to be transferred to France, where the company's works are already situated, and the company is to be amalgamated with its French branch—the Compagnie des Forges et Acieries—so that only a French company will exist thenceforth. In addition, certain French water powers which have not hitherto been utilised by the Swiss company, are to be transferred to a new company under the title of the Hydro Electrique, and present shareholders in the former will be entitled to participate in the latter. It is expected that the firm of Schneider and Co. will derive considerable advantage from the reconstruction of the Girod company.

Delhi Electric Tramways and Lighting Co., Ltd.

MR. A. W. TAIT presided on Monday at Basildon House, E.C., over the eighth ordinary general meeting of the above company.

The CHAIRMAN, in moving the adoption of the report (ELEC. REV., p. 1014), said, taking into account the unfortunate breakdowns which had occurred in the power station during the year, they might regard the net result of the year's working as satisfactory. The increase in the revenue from the lighting section was due to the natural growth of the city and to the education of the native population to the uses and advantages of electric light and power. There had also been an increase in the revenue from the street lighting contract and in the supply of current for power purposes. Considerable expansion was to be expected in the near future, and that could be accelerated if a satisfactory hire-purchase scheme for small motors and equipments could be evolved. He was afraid, however, that owing to their heavy commitments in other directions, it was not possible for that company to undertake that class of business, at least for some time to come. The number of units generated that year was 1,429,683, an increase of 43 per cent, and the increase in the revenue, excluding the revenue from current supplied to the tramway undertaking, was 46 per cent. A new system of charging current supplied to the tramway undertaking was put into operation at the beginning of 1913, the tramways being charged at the flat rate of 1½d. per unit, and for the present year current would be charged at a flat rate of 1¼d. The increase in the revenue from the tramway undertaking (32 per cent.) was due to the revision of the fares and stages. There could be no doubt that the reduction in fares was a wise policy, and it was quite possible that further reductions would be made at an early date. The stages on the routes had also been revised and sub-divided. The number of passengers carried during the year was 4,811,106, as compared with 2,127,868 in 1912, and 52½ per cent. of those passengers were carried a distance of half a

mile for a fare of approximately ½d. The number of car-miles run was 397,969, as compared with 334,338 last year, so that with an increase in mileage of only 19 per cent., they obtained an increase in revenue of 32 per cent., and carried 125 per cent. more passengers. It was unfortunate that the breakdown in the power house plant prevented the new system having a full year's run, because, owing to the necessity of maintaining the power and lighting load, the service had to be curtailed for a considerable part of the year, and for a few weeks it was stopped altogether. With a view to developing the traffic on proper lines, they had recently sent out a European traffic superintendent. That man had had a very good experience in the regulation of traffic on one of the largest undertakings in that country, and he would be able, therefore, to do a great deal towards improving the service generally. The net revenue from the combined undertakings was £6,252, as compared with £2,990 last year, and was the largest net revenue the company had shown, with the exception of the period of 14 months to December 31st, 1911, which period, of course, included the exceptional revenue obtained at the time of the Delhi Durbar, and there was very little doubt that, but for the unfortunate mishaps in the power station, the 1911 figures would have been exceeded during the past year. The breakage of the main crankshaft of the Diesel engine, which occurred in the middle of July, involved the continual use of the more expensive steam plant for the remainder of the year, as it was not again put into commission until December. Within a short time from that mishap one of the steam sets was also put out of action, owing to a similar breakdown, and, until the company was able to obtain a supply of current from the Government power station the tramways were shut down and the power business curtailed. Supply was taken from the Government from August 7th to December 3rd. The actual cost of renewals in connection with the breakdowns referred to had been charged to renewals reserve account, but, in addition to that, the company had to suffer considerable indirect loss which was not reflected in the accounts, and which it would be difficult to estimate. The average price of coal during 1913 was also higher than in 1912, and liquid fuel firing of some of the boilers was carried on for some five months during the year, in order to increase the steam raising capacity of the plant. That expenditure necessarily increased the generation costs. Notwithstanding the facts mentioned, the average cost per unit generated during the year, including the units purchased from Government, showed a slight decrease on the average cost for 1912, the comparative figures being 1·17d. and 1·25d. respectively. Excluding the units purchased from Government, the average cost per unit was 1·08d. They would, no doubt, remember that at the last general meeting he indicated that a further Diesel set would have to be installed at no distant date; an order was placed some months ago for a 240 KW. set, and the plant commenced working on the 9th of this month. That additional set would probably enable the company to cope with the increasing demand up to the end of the next year, but by that date the installation of a further set would be necessary if the demands of the business were to be adequately met. At present they had little or no spare plant to fall back upon in case of serious breakdown to the main Diesel sets. The cost of the set now installed had, to a great extent, been met out of surplus revenue, but it was impossible to meet the cost of further considerable expenditure in like manner. In addition to the further generating set, they would undoubtedly have to add to the rolling stock at no distant date, and, even if the amount of traffic obtained did not warrant an addition of that nature, it was necessary that the existing cars, which were old and inefficient, having only single motor equipments, should be gradually replaced by cars of more suitable design and double-motor equipments. There was no doubt that the change when effected would enable the company to make considerable savings in running expenses. Several of the feeder cables were fully loaded, and they should have to face substantial requirements for mains and feeders in the near future, and some part of that expenditure, at all events, would have to be met before the end of the present year. In order to meet these requirements and also to effect improvements and additions to other parts of the company's equipment, which had now been in continuous service for over six years, the total amount required within the next year or so, according to an estimate submitted by the general manager, would not be less than £25,000. That sum did not, of course, include any expenditure which might be necessary in connection with a supply to the new city of Delhi, as it was, at the present time, impossible for the company to issue any additional share capital, and as the whole of the £50,000 first mortgage debentures had now been issued or lodged with the company's bankers to secure advances, the directors proposed to create an issue of £50,000 in second debentures. As those debentures would, of course, rank after the £50,000 already issued, it would probably be necessary to offer a fairly high rate of interest in order to enable the debentures to be placed. The rate of interest suggested was 7 per cent. The directors hoped that when the issue was made the shareholders would assist by subscribing to the same, as it was only by this means that the shares which they held would secure dividends in the near future. With regard to the supply to the new City of Delhi, he regretted that it was not possible for him to give them any definite information, but he might say that they had not yet been asked to tender for the supply. They had, therefore, decided to continue additions to the existing station, to meet present and immediate future requirements, quite apart from any question of that kind, because of the uncertainty which apparently still exists as to the intentions of Government with regard to the lighting and tramway in the new city. The chairman proceeded to deal with the accounts at some length, and with regard to the results during the current year, said that the cablegrams received from the general manager, giving approximate monthly figures, showed that there was an estimated net revenue from the combined undertakings of some £2,486 for four months to end of April, as compared with £1,840 for the same period last year. If that increase was maintained for the balance of the year, and they had no recurrence of breakdowns, the results should show an improvement of approximately £3,000 to £4,000, as compared with the year under review. He had already indicated that considerable development might possibly take place in connection with the supply of current for power and lighting. It was also probable that in view of the improvements which were being made in the old city, the revenue from the street lighting contract would also show a considerable increase. As regarded the supply in the new area, he had already stated that the company had not yet been asked to put in a tender for the supply, and it was, he thought, unnecessary for him to say that, in the event of their being approached to give that supply, the work would not be undertaken until the estimates had received the careful consideration of independent consulting engineers, and there seemed to be a reasonable prospect of the business proving profitable to the company, and then only with the approval of the shareholders first obtained. He thought it was also safe to anticipate that the results of the tramway undertaking for the current year would show considerable improvements over those of the year just closed, since, owing to the breakdowns, it had not been possible to give the new scheme a fair trial during the past year. It was to be hoped, moreover, that they should be free from any further mishaps of that nature, and that the tramway service would not again be subject to serious dislocations. There could not be any doubt that it was necessary for them to establish a reliable and speedy service at a cheap rate of fare, in order to attract the native population. In other words, the company's profit in this branch of the undertaking must be made through the medium of low fares and high earning power per mile, as opposed to high receipts per passenger. For 23 weeks to June 6th, 1914, they carried 2,418,000 passengers, as compared with 2,054,000 for the same period last year, and earned Rs. 62,800, as compared with Rs. 56,700 last year. It was certainly desirable to provide, as soon as possible, cars of more modern make, and with double equipments, in order to effect economies in working. The existing cars were not, in spite of careful and repeated overhaul, in a satisfactory condition, and there was no doubt that the annual maintenance charge was much heavier than would be the case with cars of more modern design. The results for 1913 were good, but he believed they might confidently anticipate that the results for 1914 would be much better, but, as stated at the last general meeting, he was afraid it would be necessary for them to retain the profits in the business for the purpose of meeting the cost of additions to plant and equipment, unless means could be found to raise the additional capital by the issue of debentures.

Mr. T. W. Stratford Andrews seconded the motion.

Mr. Still considered it unfortunate that after eight years they had to go to the Government station for a supply of current. He trusted that with regard to the new city of Delhi, they would not sit quietly, but would try and secure the opportunity of tendering. He also asked what the company's experience was with regard to oil plant. Was it such that it would warrant them going in for further plant of the same kind?

Mr. Pullens congratulated the company on the progress made since the board was reorganised, and the able way in which the board had pulled the company out of the mire. He thought they ought not to look forward to paying dividends in the near future, but should seek to improve the financial position of the company without resorting to onerous borrowing.

The Chairman said the Government power house was installed to meet the requirements of the Durbar, and was now being used to supply the new works in Delhi. The Government were not competing with the company. They were advised from the plans and details which they had seen that the electric supply of the new city would cost £250,000 to £300,000. They were in close touch with the Government, but the new city was going to be laid out on broad and generous lines, and it would involve a great expenditure in mains and feeders to supply a district which, after all, would only require a good supply during the six months the Government was sitting. There could be no doubt that the oil engines compared favourably with the steam plant. The first Diesel engine was undoubtedly not well designed, but the new engine was admirably designed, and the manager had expressed absolute approval of it. The business was growing so much that he did not think they could finance it with their own profits, and they must raise more money, as he had stated in his speech.

The report was then adopted

Hydro-Electric Power and Metallurgical Co., Ltd.—The *Financial Times* states that an extraordinary general meeting of this company will be held at Melbourne, Australia, on June 29th, to consider extraordinary resolutions to ratify an agreement between Complex Ores, Ltd., and the company, whereby ComplexOres, Ltd., has agreed to reassign shares of the company to the company and to ratify an agreement between the Government of Tasmania and the company for the sale of the company's hydro-electric works.

Reduction of Capital.—The Reason Manufacturing Co., Ltd., and Reduced.—A petition for the confirmation of the reduction of capital from £37,553 to £23,648, has been presented, and will be heard on June 30th.

Shawinigan Water and Power Co.—A dividend at the rate of 6 per cent. on the common stock for quarter to June 30th is announced.

General Electric Co., Ltd.

The directors report that for the year ended March 31st, 1914, the net trading profits and income from investments, &c., amounted to £157,894, plus £32,331 brought forward, making a total available profit of £190,225. Debenture interest requires £8,000, depreciation and provision for removal expenses £24,328, and dividend on the preference shares at the rate of 6 per cent. for the year ended March 31st, 1914, absorbs £24,000, leaving an available balance of £133,896. Provision for managing director's and employés' bonus stands at £10,156; provision for expenses of new issue of capital, since made, £14,000; provision for dividend on ordinary shares at the rate of 10 per cent. for the year ended March 31st, 1914, £40,000; to reserve account, £30,000; to conditional appropriation to staff benevolence, £3,000; balance to be carried forward, £36,740. The reserve account stands as follows:—The balance at March 31st, 1913, was £170,000, and the proposed appropriation of profit of the year amounts to £30,000, making a total of £200,000. The directors are pleased at the progress shown in the result of the year's trading. The company's works have been fully employed, and extensions are being proceeded with. The increase in stock and sundry debtors is normal in proportion to the company's increased sales. The contingent liability referred to in the balance-sheet is chiefly in respect of participation in the Pirelli-General Cable Works now being erected at Southampton.

We give below the comparable figures from the reports for the three years ended March, 1912, 1913 and 1914:—

	1912.	1913.	1914.
Net trading profit and income from investments... ...	£133,564	£145,261	£157,894
Depreciation and debenture interest	32,400	32,543	32,328
Balance	113,377	144,768	157,897
Pref. dividend	12,500 (5 %)	19,878 (6 %)	24,000 (6 %)
Available balance	100,877	124,890	133,896
Managing director's and employés' bonus	8,866	9,284	10,156
Expenses of new issue of shares	—	10,275	14,000
Staff benevolence	—	3,000	3,000
Ordinary dividend	29,960 (7½ %)	40,000 (10 %)	40,000 (10 %)
To reserve account	30,000	30,000	30,000
Balance carried forward ...	32,050	32,331	36,740
Reserve fund total	140,030	170,000	200,000

The annual meeting is to be held on Thursday next at Cannon Street Hotel, E.C.

British Electric Traction Co., Ltd.

The annual meeting was held on June 19th at the Holborn Restaurant, Mr. E. Garcke presiding.

The Chairman, in moving the adoption of the report (see Elec. Rev., p. 1,004), said that in order to understand the position of the company it was necessary to appreciate that it was a part of a Federation of some sixty companies, having a combined capitalisation of about £24,000,000. The B.E.T. was the largest of the companies in the Federation and was in other respects the centre of the system. All except about 5 per cent. of their total assets, amounting to close on £5,000,000, were represented by holdings in, or by other properties held in connection with, the federated companies, and about 95 per cent. of all their revenues of £225,000 was derived from the associated companies. The net revenue earned by all the federated companies, that was after paying all working expenses, amounted to £1,200,000 for the year. Of this about £800,000 was distributed in debenture interest and dividends on capital, and as much as £400,000—about a third of the total net profits—was held in reserve in one form or another by the federated companies. The profits earned by the associated companies during the past year showed a substantial increase over those of the preceding year, and an analysis showed that of the increase in the total net profits earned by all the federated companies about three-fourths was due to the tramways and electricity supply departments in about equal proportions, and about one-fourth of the increase in profits was due to the working of motor omnibuses. It was not correct to assume that the tramways had gone back and that the increase in profits was mainly due to motor omnibuses. On the contrary, the tramways had had a better year and the electricity supply business of the federation had also made satisfactory progress. Of the profits distributed for the past year by the federated companies in interest and dividends, the B.E.T. Company received about £200,000. The remainder went to other debenture and stockholders in the federated companies. He had on former occasions explained the importance, for purposes of comparison of one year with another, of the figures of yield obtained by the company on its investments, and he was glad to be able to again record a substantial improvement in this respect. The yield on all their investments, taken collectively, last year was 4.47 per cent., compared with 4.11 per cent. for the preceding year, and 3.77 per cent. for the year 1911. An all round average net return of 4½ per cent. was not bad. Those who looked only for the bad features in their large collection of undertakings and pointed to Bideford and Sheerness, where they made small losses, and to a few others where they made no profit, should remember that if with an average of 4½ per cent. they had some that were not yet earning anything, there must be a large proportion which were earning much more. By reference to published statistics it would be seen that an average yield of 4½ per cent. was high for electrical undertakings in this country in their present stage of development. He was responsible for the compilation of a year book which contained a summary of all obtainable balance sheets of electrical undertakings in the United Kingdom and the Colonies, and that showed an average return which was less than their figure, excluding telegraph and telephone undertakings, in which they were not interested. He could not take them over the whole ground of the company's operations during the past year, but he had no hesitation in saying that considerable improvement had also been made by the various federated companies in other respects, particularly in their relations with the local authorities and in the terms on which the companies held their concessions, and generally in the efficiency of the undertakings. The means by which these numerous enterprises steadily improved their condition and prospects were to be found in the splendid organization which had been built up and which was effective for doing more and more work with ever better results over an extensive field, and although, as he had frequently explained, while profits derived from public service enterprises in this country—be it the National Telephone Company or a small tramway undertaking—were not yet commensurate to the skill and energy which were applied to the businesses, they had achieved some remarkable success, both financial and technical, in this country and abroad. Even collectively the results of their enterprises compared favourably with those obtained by others carrying on similar business in this country. In saying this he was not blowing his own trumpet, but it was only fair to those who had loyally devoted a strenuous life to the establishment and maintenance of these public utility enterprises that they should have their services acknowledged even if only in his feeble words. He could very well imagine some of the stockholders feeling that the large figures which he had mentioned, and the good report he had made of the progress which had been achieved, were not compatible with the fact that the preference stockholders were receiving only a small increase in dividend and the ordinary stockholders were still a long way off receiving any return on their investment. When the rearrangement of capital was made in 1911, it was understood that the policy would be to distribute moderate but improving dividends on the 7 per cent. preference stock, and at the same time to increase the reserve by an annual contribution out of profits. At the first annual meeting after the rearrangement had been made, he again pointed out that the question of what reserves should be made deserved further consideration, and he stated that the federated companies were then engaged in an exhaustive examination of the whole question of reserves with a view to each of the companies allocating its profits between reserve and dividends in such a way that, while adequate provision would be made for replacement of circulating and renewable capital, dividends were not to be withheld because of indefinite apprehensions that depreciation of fixed or permanent capital had in every case to be provided for out of profits. At the following annual meeting, that was to say last year, they recommended the payment of a first dividend of 3 per cent. for the year on the 7 per cent. preference stock and the placing of £40,000 to reserve. It was admitted that the increase of dividend on the 7 per cent. preference stock which they recommended was smaller than the increase of profits justified. This year they proposed to apply the available balance of £126,000 as follows: £56,400 to be reserved, £52,000 to the payment of dividends, and £17,000 to be carried forward. That was to say, the amounts which this year were placed to reserve and carried forward were proportionately larger, and the amount applied to the payment of dividend was proportionately smaller, than last year, although the balance of profit they had to deal with was larger. It was clear on the figures that they could pay a larger dividend on the 7 cent. preference stock than the 3½ per cent. for the year, which the directors recommended, and if it were not for capital depreciation which was shown by the investments the question would certainly arise, whether, in view of the fact that the associated companies put to reserve in one form or another one-third of their net profits, it was really necessary also for this company to put to reserve one-fourth of its profits received from the associated companies. It was evident that divergent views and interests existed among the stockholders in regard to this question. It was very desirable that these differences of view should be adjusted, and it was probable that they could be reconciled only by a reduction of capital. They could not ignore the fact that the interests of the preference stockholders and those of the ordinary stockholders were not quite identical in regard to this matter. The preference stockholders, of course, desired that the profits should be distributed, at any rate to the extent of their preferential dividend rights. The ordinary stockholders on the other hand preferred that the profits should be allowed to accumulate so as to assist in the removal of the depreciation on the investments. They had therefore formulated for the consideration of the stockholders a scheme of reduction and rearrangement of capital which, if adopted, would immediately give the ordinary

stockholders some return on their capital, while it did not contemplate any sacrifice by the preference stockholders for which they were not adequately compensated. At the same time, the carrying out of the scheme would improve the dividend prospects of both classes of stockholders by making available for dividends some of the profits now placed to reserve. Whether this, or any other scheme of reduction of capital should be carried out was entirely a question for the stockholders to decide. There were five different and conflicting interests to be consulted and satisfied, namely, two classes of preference stockholders, two classes of ordinary stockholders, and the holders of income certificates. The board occupied a neutral and impartial position in regard to the matter, and during the discussion that would ensue on the subject the directors would take every care that no class of stockholders should receive an unfair advantage. Subject to what might be said at the meeting, the directors proposed to submit the scheme which they had formulated to a few representative stockholders, including most of those who served on the committee of consultation at the time of the rearrangement of capital, and as soon as possible they would send a memorandum on the subject to all the stockholders in order to ascertain their views before any more formal steps for the carrying out of the scheme were taken. Having referred at length to the progress of the motor omnibus department of the company, Mr. Garcke concluded by a reference to future prospects. The electricity supply business was, he said, continuously progressive, and they were not afraid of the new increased efficiency lamps which had been put on the market on the ground that they used less current, for they would tend to increase consumption by making electric lighting cheaper and by encouraging a higher standard of lighting. They expected to secure additional profits from the new omnibus services they had started, and they believed the Brush Company would do better in future by reason of a new and highly efficient turbine, the manufacturing rights of which it had secured. The Bombay Company, the Auckland Company in New Zealand, the electric power company in Canada—in all of which they had large and important interests—were doing well and were yielding good returns. Altogether, he felt justified in saying that the prospects were good. They hoped that an understanding between the two main sections of the proprietary would enable the profits they expected to earn to be equitably shared by all, and that in the efforts which the different sections of stockholders would no doubt make to secure the best terms for themselves, the collective and permanent interests of the company would not be allowed to suffer by reason of sectional differences, and that no interruptions would be caused to the steady progress of the business.

Mr. W. L. Madgen seconded the motion, which was carried after a short discussion.

Marconi International Marine Communication Co., Ltd.

The directors' report for the year ending the 31st December 1913, states that the company's business continues to show satisfactory progress, the net profit for the year amounting to £37,029 after deducting £23,881 for depreciation and allowance for debenture interest, as compared with a net profit of £24,436 for the preceding year. The revenue from ships' telegrams, subsidies, etc., amounted to £146,317, which is a substantial increase over the amount of £100,323 for 1912. The number of telegraph stations owned and worked by the company as public telegraph stations on the high-seas increased from 580 at the end of 1912 to 788 at the end of 1913. The number fitted to the present date is 873. There are now some 2,000 ships of different nations, exclusive of ships of war, fitted with Marconi telegraph stations. The company's business is well organised and the discipline on board ships excellent. Of this there could be no better testimony than the immense number of lives and the number of ships which the company and its officers have been instrumental in saving in the past, and continue to save year after year. An International Convention for the safety of life at sea was signed in London on 20th January, 1914, and the bill to give effect thereto is now before Parliament. Under this bill wireless telegraphy is rendered compulsory upon ships carrying 50 or more persons, including crew. It is probable that this is only intended as a first step in this direction, for it is difficult to understand why when 50 persons are on board a ship they should be provided with the means of being saved, but if the number be only 49 all may be allowed to drown. In the opinion of the directors, every ship which sails 50 miles or more from the coast, should be fitted with wireless telegraphy. Apart from the necessity of providing so valuable a life-saving apparatus for those employed upon the smaller craft, it is obvious that when misfortune befalls a large vessel, every small boat within the radius of a wireless call should be capable of being summoned to immediate aid. Had this been the practice in recent years many more thousands of valuable lives would have been saved. In Australia the company's licence and business have been transferred to a company representing an amalgamation of interests in which this company holds a number of shares. In July, 1913, the directors offered 102,028 shares at a premium of 5s. per share to the shareholders in proportion to their holdings. The issue was guaranteed by the Spanish and General Wireless Trust Limited in consideration of a commission of 1s. 6d. per share on the whole issue and an option over the remaining 43,916 unissued shares of the company at the price of £1 5s. for two years from 27th June, 1913, and the whole of the shares offered were duly subscribed and allotted. In accordance with the power contained in Articles 29 and 30 of the company's Articles of Association, the directors in January last adopted regulations for the issue of share warrants to bearer and copies of such regulations may be obtained upon application to the company. Being of opinion that the time had arrived to make some provision for the employees of the company on retirement, the directors have entered into a provisional agreement with the North British and Mercantile Insurance Co. for the establishment of a superannuation fund. An Extraordinary General Meeting will be held immediately after the Ordinary General Meeting to approve the necessary alteration to the Memorandum of Association authorising the company to adopt the scheme. The directors recommend a final dividend for the year 1913 of 5 per cent., which with the interim dividend already paid will make 10 per cent. for the year, the total of which will amount to £30,604. £3,500 is allocated to the repayment of debenture account, leaving £6,068 to be carried forward. On 10th July, 1913, General Albert Thys was elected to the board.

Victoria Falls and Transvaal Power Co., Ltd.

The directors report that at 31st December, 1913, the issued share capital amounted to £3,000,000 and the debenture capital to £3,976,500, £23,500 of the 5½ per cent. second mortgage debentures having been purchased during the year 1913, against the amount which had to be redeemed on 1st January, 1914, in the terms of the trust deed. Since December, 1913, a further £650,000 of the 5½ per cent. second mortgage debentures have been issued. The year's business has resulted in a profit of £467,824, which, with the £96,787 at the credit of the profit and loss account as at 31st December, 1912, remaining after payment of the dividend on 14th June, 1913, makes a gross total of £564,611. After providing for interest on debentures for the year 1913, amounting to £203,921, and for depreciation, etc., amounting to £135,491, the balance remaining is £225,198. In respect of this balance the directors declared a dividend, on 11th December last, at the late of 6 per cent. per annum, less income tax, for the six months ended 30th June, 1912, on the preference shares, and a further dividend on the preference shares also at the rate of 6 per cent. per annum, less income tax, for the six months ended 31st December, 1912, was declared on the 11th June, 1914. These dividends were paid to the shareholders on the 6th January, 1914, and 17th June, 1914, respectively, and absorbed £119,999 14s., leaving £105,199 to be carried forward. Referring to last year's report, new machinery of the capacity of 30,000 h.p. has recently been brought into service at Simmerpan, the extensions at Rosherville in connection with the air system will shortly be in commission, and the installation of additional plant at Brakpan is progressing rapidly and will be available by the end of the year. Judgment has been given against the company in the action brought by the Consolidated Langlaagte Mines, Ltd., for about £29,000. The company has appealed to the Appeal Court against the judgment, and the matter is therefore *sub judice*. The directors record the death during the past year of two of their colleagues, viz., Mr. Hans Schuster and the Honourable J. R. Delap Tollemache. They have appointed Mr. Frank Astley Cooper a director.

Aron Electricity Meter, Ltd.

The directors' report for the year ending 31st March, 1914, states that the profit and loss account for the year, after providing for general charges and depreciation, shows a net profit of £28,771, making, with £5,865 brought forward, a total available profit of £34,635. Out of this the directors distributed in December last a dividend of 3 per cent. on the preference shares, absorbing £3,747, leaving to be disposed of £30,889. The directors recommend the payment of a further 3 per cent. on the preference shares, absorbing £3,747, and making a total for the year of 6 per cent.; a dividend of 7 per cent. on the ordinary shares absorbing £8,750; a transfer to reserve towards goodwill and patents of £15,000 (making this reserve £70,000), and carrying forward £3,392. The past year's trading in electricity meters and taximeters has again been most satisfactory, and the results would have been considerably better had it not been for the practical stoppage of business in Austria-Hungary during the critical times of the Balkan War. The directors state that the other branches, especially in Germany, France and England, have shown the usual progress, and during the last few months business in Austria-Hungary has begun to resume its normal condition. The directors refer to the death, during the past year, of the late Prof. Aron, the managing director of the company. His son, Mr. Manfred Aron, who has held a position of responsibility with the company for some years past, has been appointed a director in his place.

J. G. White & Co., Ltd.

The directors report that for the year to February 28th, 1914, the results of the business, considering the depressed financial conditions which have hampered the development of new construction enterprises, have been fairly satisfactory, and show a net profit of £70,387. A further £15,000 is allocated out of profits to the general reserve, making this reserve now £135,000. The directors again recommend a dividend of 12 per cent. per annum on both classes of shares, and, in addition, an extra dividend of 10s. per share on the ordinary shares. The balance to the credit of profit and loss, after bringing in £22,904 from the previous account, deducting the interim dividend paid on the preference and ordinary shares at January 1st, 1914, and making provision for percentages due to directors and staff, is £73,786. The directors recommend a dividend of 6 per cent., less income-tax, on the cumulative preference shares for the half-year to February 28th, 1914 (making 12 per cent. for the year), £9,000; a dividend of 6 per cent, less income-tax, on the ordinary shares for the same half-year (making 12 per cent. for the year), £3,000; an extra dividend of 10s. per share, less income-tax, on the ordinary share capital for the year, £25,000; to general reserve, £15,000; to be carried forward, £21,786.

Electric and General Investment Co., Ltd.

The directors report that the gross profit on the transactions for the year ended May 31st, 1914, was £15,282. After deducting all general charges, interest on debenture stock, the interim dividends already paid on the preference and ordinary shares, and providing for the proportion of the final dividend accrued on the preference shares to May 31st, 1914, there remained a balance of £5 438, plus £2,922 brought forward, making £8,360; £3,285 of this amount has been carried to the contingencies fund, making the amount to the credit thereof £84,000 as at May 31st, 1914, leaving £5,075. The directors recommend a balance dividend of 1s. per share, which with the interim dividend of 1s. per share paid in January will make the full rate of 10 per cent. on the capital paid up on the ordinary shares, £1,000; a dividend of 6d. a share on the deferred shares, £1,000; leaving £3,075 to be carried forward.

Globe Telegraph and Trust Co., Ltd.

The annual meeting was held on June 23rd, at Electra House, E.C., Sir J. Wolfe Barry, K.C.B., presiding.

In moving the adoption of the report (Electrical Review, page 1043), the Chairman said that there were certain changes in the receipts as compared with those of last year. The total receipts from all sources for the 12 months ended May 31st last, after deducting the necessary working expenses, amounted to £209,773, as against £209,827 in the preceding year, or a decrease of £54, and made with the balance brought forward £236,590. They had distributed to their ordinary shareholders the three usual quarterly interim dividends of 2s. per share net, and to the preference shareholders three quarterly fixed interim dividends of 3s. per share, being at the rate of 6 per cent. per annum, less income-tax. These distributions had absorbed £131,085, and the directors now recommended the payment of a final dividend on the ordinary shares of 6s. per share net, making with previous distributions a total dividend on those shares of 6 per cent, net. This, together with the amount required for the final dividend of 3s. per share, less tax, on the preference shares, would absorb £79,780, and leave £25,723 to be carried forward. Although they were again distributing to the ordinary shareholders a dividend at the rate of 6 per cent. per annum, as they had done for the last two or three years, the receipts, which were almost exactly the same as last year, were not in themselves quite sufficient to pay that 6 per cent. dividend; and the directors were drawing on the balance carried forward from year to year to the extent of about £1,100. This balance, which formed a very useful fund for the equalisation of dividends, was started in 1907, when it amounted to £26,565. Since that date, they had sometimes added to it, and sometimes drawn upon it, so that now, after seven years, it still amounted to much the same sum as it did, namely, to £25,723. They would thus see the directors were on very safe ground in withdrawing £1,100 at the present time to maintain their 6 per cent. dividend to their ordinary shareholders. During the year under review, the directors had continued the policy of re-arranging some of the investments of the company in cases where they had considered it advisable for the general benefit of the shareholders; and, accordingly, they would find in some cases, where they had sold stocks, that there was in the year under consideration a decrease in the receipts, while from other companies in which the directors had made purchases they had larger receipts. There were, however, in the year's accounts three items of fluctuation which were not affected by any changes in investments such as those to which he had just referred. One was that of the Submarine Cables Trust, in which case 15 certificates were drawn for payment at £120 per certificate. This money, of course, had been suitably re-invested. The second was that of the West Coast of America Telegraph Co., which, he was sorry to say, owing to heavy expenses in connection with their cable, had passed their dividend this year, involving, consequently, a loss of income; and the third was that of the Western Union Telegraph Co., which had increased their dividend from 3 per cent. to 4 per cent. It was his duty, however, to make the same remark as he often had to make when changes had taken place such as he was reporting to them then, viz., that their present accounts did not show the full effect of these changes, as it would not be until the close of the company's financial year 12 months hence, that they would be able to show exactly what the result would be; in fact, until they should have received the full year's dividends on the new stocks purchased. But this much they were able to say: that, when that time came, it would, unless unforeseen circumstances arose, show an increase in their receipts. For example, that year's accounts only included the increased dividend for one quarter of the year from the Western Union Telegraph Co. Taking everything into consideration, their prospects generally might be considered as very encouraging. There was only one other item that he thought he need mention to them, and that was to tell them that the present market value of the securities they held, taking the lowest present market price, showed a surplus over the original capital of £227,598.

Sir James Pender, Bart., seconded the motion, which was carried unanimously, and the retiring directors and auditors having been unanimously re-elected, the proceedings closed with a vote of thanks to the directors and chairman.

Rushden and District Electric Supply Co., Ltd.

The report for the year ended December 31st, 1913, shows that nearly the whole of the expenditure during the year was on capital account. As the company only commenced a supply of electricity in October, no substantial revenue could be expected, and there is consequently a small adverse balance of £8 8s. The number of consumers is rapidly increasing, the number now connected to the mains or having electricity installed being 56, and the number of 32-watt lamps or equivalent being 2,480. Additional mains have been laid to the extent of 1,482 yards since the date of the last report in November, making a total length of 3 miles 762 yards.

Edgar Allen & Co., Ltd.—A dividend of 10 per cent. and a bonus of 2½ per cent. per annum on the ordinary shares are recommended for the year ended March 31st.

Winnipeg Electric Railway Co.—The directors have declared a dividend at the rate of 3 per cent. for the quarter ending June 30th.

Trafford Power and Light Supply, Ltd.—Out of a net credit balance of £4,043 the directors recommend the payment of 5 per cent. on the preference shares for the year ended March, 1914. The arrangement for the sale of the property and undertaking to the Manchester Corporation having fallen through, the directors consider it reasonable to anticipate that an offer of purchase may in the near future be received from some other source.

Bell Telephone Co. of Canada.—A financial paper states that the directors have declared a quarterly dividend of 2 per cent.

Stock Exchange Notices.—Applications for quotations in the Official List have been made for the following:—

Toronto Power.—Further £638,857 4½ per cent. consolidated guaranteed debenture stock.

Underground Electric Railways of London.—Further £179,000 6 per cent. £100 income bonds, Nos. 28,282 to 30,071.

Veritys.—7,000 5 per cent. £10 first preference shares fully-paid.

The Committee has ordered the following to be quoted in the Official List:—

Costa Rica Electric Light and Traction Co.—Further £28,050 5 per cent. first debenture, Nos. 2,557 to 2,623, 2,641 to 2,722, and 2,757 to 2,766 (£100), and 1,631 to 1,879 (£50).

Pennsylvania Water and Power Co.—$8,495,000 capital stock in $100 shares.

Russian Marconi Co.—The *Financial Times* states that at the annual meeting of the Société Russe de Télégraphes et Téléphones sans Fil (Russian Marconi Co.), held in St. Petersburg on June 13th, a dividend of 6 per cent. was declared.

Siemens Bros. & Co., Ltd.—The directors (according to the *Financier*) recommend a dividend of 5 per cent. (5s. per share) for the year ended December, 1913, placing £5,000 to a buildings reserve, and carrying forward £17,196.

New British Ever-Ready Co., Ltd.—The directors report that for the period from January 1st, 1913, to March 31st, 1914, there was a profit, after writing off depreciation, one-third preliminary expenses, &c., and transferring £2,500 to general reserve, of £17,723. A final dividend on pref. shares at the rate of 1½ per cent. per annum, making 8½ per cent., is recommended, also a dividend of 8½ per cent. on ordinary shares. £858 is to be carried forward.

The directors state that in order to cope with the increasing business of the company an additional factory of approximately 25,000 sq. ft. area has been leased at Fonthill Road, Finsbury Park, and is now in full working order.

Prospectus.—*Northern Electric Co., Ltd.*—There are being offered for subscription until to-morrow $3,500,000 first mortgage 5 per cent. sinking fund gold bonds, at 95 per cent., in this company, which is a consolidation of the Northern Electric and Manufacturing Co., Ltd., and the Imperial Wire and Cable Co., Ltd., both of which has been operating in various parts of Canada for some years.

Continental.—German Parsons Turbine Co.—The directors recommend dividends of 8 per cent. on the preference shares and 20 per cent. on the ordinary shares. The profits for the year amounted to £18,597.—*Financial Times.*

STOCKS AND SHARES.

Tuesday Evening.

The Stock Exchange pendulum swings backwards and forwards in somewhat aimless fashion. Probably a good many people who are interested would say that it swung more backwards than forwards, and certainly the hopes that were raised in connection with cheap money have been dashed as regards prices by fresh outpourings of new issues, collective millions of pounds being required by the Port of London, the Union of South Africa, the Russian Government, various municipalities and other borrowers. These demands absorb available capital, and perhaps to a greater extent than people may think, for already some of the banks are intimating to customers that they will be unable to grant fresh facilities at the present time, and that if loans could be repaid, they, the banks, would not feel sorry.

The Home Railway market is in melancholy mood, by reason of the distrust felt with the labour situation. Moreover, the political outlook—especially as regards Ulster—has again assumed an obscure aspect, and the two lawless armies of volunteers in Ireland present a menace to prices in proportion as they threaten to break the peace. These things militate seriously against the values of domestic securities, and most of the Home Railway stocks are lower on the week. The weakness, however, has not affected the Underground group; in fact, Metropolitans recovered their point loss of last week, and Districts have also rallied. The Underground Electric Railways group is steady. The Birthday Honour accorded to its general manager aroused interest and pleasure in the Home Railway market.

The British Electric Traction meeting had no effect upon the prices of the company's stocks. Practical interest is now suspended, of course, waiting for the presentation of the directors' scheme of capital reorganisation. The various London traction issues are steady, and no Londoner can fail to observe the phenomenal popularity of the London General Omnibus Company's services of motor-'buses, which seems to advance by leaps and bounds.

Mexican matters are on the mend one day and in the melting-pot the next. Prices move accordingly, but the net results are trifling, so far as this week is concerned. Of the Mexican Light and Power issues, the First Mortgage Gold bonds are two points higher, but Mexico Tramway varieties are unchanged. Brazilian Tractions rose to 81½, but reacted to 79½ in company with most of the other stocks and shares connected with Brazil, which are less in favour than they were a week ago. Brazilian securities of all kinds are hanging for the moment upon the chances of the Republic raising the £15,000,000 loan which is required; and as the prospects for this issue grow big or blurred, so do quotations improve or decline. Para Electric Ordinary shares rose to 4¼, and Rio de Janeiro bonds of both classes have further advanced. Brisbane Trams hardened to 7½, following upon their improvement of last week.

In the list of Electricity Supply shares the movements are mainly downward. This has come about principally from sympathy with other purely investment departments. The falls which have occurred affect Charing Cross Ordinary and Preference, Chelsea, County Preference, and St. James's Ordinary, all of them influenced by the same general set of conditions which apply to the Stock Exchange as a whole. Oxfords improved to 6½, and both Preference issues of the Bournemomth and Poole Company advanced, the demand in the cases being based upon the expectation that the companies will be bought out at prices satisfactory to proprietors.

In the manufacturing division, the feature is a rise of $\frac{3}{16}$ in General Electric Preference to 10⅝, on the publication of an excellent report which shows the company to have made all-round progress during the past 12 months. The new Preference are ⅛ to ¼ premium, while the new Ordinary stand at $1\frac{7}{16}$ premium, the last-named being a shade better on the week. There are also some old Ordinary shares of the company, very rarely dealt in, which stand in the neighbourhood of £12. Castner-Kellners have again improved. British Westinghouse Preference are quiet, remaining at 35s. The Brush Debentures retain their improvements. Arons are unchanged at 15s. middle, notwithstanding the reduction in the profits, as shown by the report just out; the dividend is maintained at 7 per cent.

Marconis are one of the best features of the moment. The price this Tuesday morning rose to 3¼ bid, nearly 10s. higher than it was a week ago, and the Preference at 2¾ were equally strong. Rumour has been insistent upon an important contract having been arranged between the company and the Chinese Government, but official confirmation so far is lacking. The imminence of the report is another factor that has contributed to the uneasiness of the bears, whose repurchases have been the main stimulus to the strength of the shares. A slight reaction from the best naturally occurred. Canadian and American Marconis stick at 6s. 9d. and 13s. 9d. respectively. Marconi Marines hardened to $1\frac{7}{16}$, the company's report being read as favourable.

Telegraphs and Telephones are steady and placid. Anglo-American Telegraph Deferred and Preferred both fell ¼, and Cuba Telegraphs are 10s. lower at 8½. Telegraph Constructions remain dull at 37, nor has there been any recovery in West India and Panama issues. The Eastern group is firm.

The Shawinigan Water Company has again declared its usual quarterly dividend of 1½ per cent., and on this the shares rose to 137, a gain of 3 points. Montreals advanced 4. In fact, the Canadian division as a whole is steady to better, and a couple of British Columbia issues registered small gains. The only noticeable weakness in the Foreign Power group is a further fall of 3 in Cordoba Light and Power 5 per cent. Debenture, following upon a drop of the same extent last week.

The Metal markets have been tending to weakness, and rubber has come down to 2s. 3½d. per lb. This week's auction sales of rubber in Mincing Lane opened rather disappointingly, and at the monthly Antwerp sale the prices realised were about 30 centimes less than those of a month ago. This week's opening of the Rubber Exhibition at the Agricultural Hall has given no fillip to interest in rubber shares; and in spite of several satisfactory reports from the younger companies, the share market remains in a state of quiet dulness.

MARKET QUOTATIONS.

It should be remembered, in making use of the figures appearing in the following list, that in some cases the prices are only general, and they may vary according to quantities and other circumstances.

Wednesday, June 24th.

CHEMICALS, &c.	Latest Price.	Fortnight's Inc. or Dec.
a Acid, Hydrochloric .. .. per cwt.	5/-	..
a „ Nitric .. .. „	22/-	..
a „ Oxalic .. .. .. per lb.	2¼d.	..
a „ Sulphuric .. .. .. per cwt.	5/6	..
a Ammoniac Sal .. .. .. „	42/-	..
a Ammonia, Muriate (large crystal) per ton	£29	..
a Bleaching powder .. .. .. „	£6 5	..
a Bisulphide of Carbon .. .. „	£18	..
a Borax .. .. „	£17 10	..
a Copper Sulphate .. .. .. „	£21	..
a Lead, Nitrate .. .. .. „	£28 10	£2 dec.
a „ White Sugar .. .. „	£27 10	..
a „ Peroxide .. .. .. „	£32	..
a Methylated Spirit .. .. .. per gal.	2/6	..
a Potassium, Bichromate, in casks per lb.	8½d.	..
a Potash, Caustic (88/90 %) .. per ton	£22 10	..
a „ Chlorate .. .. .. per lb.	8¼d.	..
a „ Perchlorate .. .. .. „	8¾d.	..
a Potassium, Cyanide (98/100 %) .. „ (for mining purposes only)	7½d.	..
a Shellac .. .. per cwt.	70/-	..
a Sulphate of Magnesia .. .. per ton	£4 10	..
a Sulphur, Sublimed Flowers .. „	£8 10	..
a „ Recovered .. .. „	£5 10	..
a „ Lump .. .. .. „	£5 5	..
a Soda, Caustic (white 70/72 %) .. „	£10	..
a „ Chlorate .. .. .. per lb.	3¾d.	..
a „ Crystals .. .. .. per ton	£2 5	..
a Sodium Bichromate, casks .. per lb.	3d.	..
METALS, &c.		
b Aluminium Ingots, in ton lots .. per ton	£86	..
b „ Wire, in ton lots (1 to 14 S.W.G.) „	£107 6 8	..
b „ Sheet, in ton lots .. „	£112	..
p Babbitt's metal ingots .. .. „	£50 to £221	..
c Brass (rolled metal 2" to 12" basis) per lb.	7d.	..
c „ Tube (brazed) .. .. „	9¾d.	..
c „ „ (solid drawn) .. „	7¾d.	¾d. dec.
c „ Wire, basis .. .. .. „	7¾d.	..
c Copper Tubes (brazed) .. .. „	9¾d.	¼d. dec.
c „ „ (solid drawn) .. „	9¾d.	¼d. dec.
g „ Bars (best selected) .. per ton	£77	..
g „ Sheet .. .. .. „	£77	..
g „ Rod .. .. „	£77	..
d „ (Electrolytic) Bars .. „	£64	£1 5 dec.
d „ „ Sheets .. „	£82 10	£1 5 dec.
d „ „ Rods .. .. „	£70	£1 5 dec.
d „ „ H.C. Wire per lb.	8¾d.	¼d. dec.
f Ebonite Rod .. .. .. „	4/6	..
f „ Sheet .. .. .. „	4/-	..
n German Silver Wire .. .. „	1/10	..
h Gutta-percha, fine .. .. .. „	8/-	..
h India-rubber, Para fine .. .. „	2/9½	¼d. dec.
l Iron Pig (Cleveland warrants) .. per ton	51/3	..
l „ Wire, galv. No. 8, P.O. qual. „	£14	..
g Lead, English Pig .. .. .. „	£19 17 6	2/6 inc.
m Manganin Wire No. 28 .. .. per lb.	6/6	..
g Mercury .. .. per bot.	£7	..
c Mica (in original cases) small .. per lb.	6d. to 8s.	..
c „ „ „ medium „	3/6 to 6/-	..
c „ „ „ large .. „	7/6 to 11/-	..
o Nickel, sheet, wire, &c. .. .. „	3/6 to 4/6 nom	..
p Phosphor Bronze, plain castings „	1/1 to 1/3½	..
p „ „ rolled bars & rods „	1/0½ to 1/3	..
p „ „ rolled strip & sheet „	1/2½ to 1/5½	..
o Platinum .. .. per oz.	185/-	..
d Silicium Bronze Wire .. .. per lb.	10½d.	..
r Steel, Magnet, in bars .. .. per ton	£65	..
g Tin, Block (English) .. .. „	£141 to £142	£2 dec.
n „ Wire, Nos. 1 to 16 .. .. per lb.	2/3	..
p White Anti-friction Metals .. per ton	£44 to £194	..
k Zinc, Sh's (Vieille Montagne bnd.) „	£25 2 6	..

Quotations supplied by—

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakspeare.
h Edward Tull & Co.
l Bolling & Lowe.
k Morris Ashby, Ltd.
l Richard Johnson & Nephew, Ltd.
m W. T. Glover & Co., Ltd.
n P. Ormiston & Sons
o Johnson, Matthey & Co., Ltd.
p
r W. F. Dennis & Co.

Consolidated Diesel Engine Manufacturers, Ltd.—During the past 10 days the financial Press has been devoting a great deal of space and attention to circulars issued by the directors and others concerning the affairs of this company. A meeting to consider the matter was held yesterday and will be reported in our next issue.

Eastern Extension and Telegraph Co., Ltd.—An interim dividend of 2s. 6d. per share for the quarter ended March 31st is announced.

SHARE LIST OF ELECTRICAL COMPANIES.

ELECTRIC RAILWAYS AND TRAMWAYS.—HOME.

NAME.	Stock or Share.	Dividends for		Closing Quotations June 23rd.	Rise + or Fall —	Present Yield p.c.
	*	1912.	1913.			£ s. d.
Bath Trams, Pref. Ord.	1	Nil	..	⅞ — 1	..	Nil
Do. 5 % Pref.	1	5	5	⅜ — ½	..	6 13 4
Do. 4½ % Deb.	100	4½	4½	70 — 75	..	6 0 0
Brit. Elec. Trac., 6 % Pref.	100	..	..	13½ — 15½	..	..
Do. Do. Deferred	100	..	..	6 — 8	..	..
Do. Do. 6 % Cum. Pr'f.	100	6	6	8²¹/₃₂ — 9¼	..	6 11 2
Do. 7 % Non-Cum. Pr'f.	100	8	8½	56 — 59	..	5 18 8
Do. 5 % Perp. Deb.	100	5	5	92½ — 94½	..	5 6 0
Do. 4½ % 2nd Deb.	100	4½	4½	77 — 80	..	5 12 9
Central London Railway, Ord.	100	8	8	57 — 62	..	4 16 9
Do. Gtd. Assented	100	..	4	82 — 84	..	4 15 3
Do. Pref.	100	4	4	68 — 73	..	5 9 7
Do. Gtd. Assented	100	..	4	84 — 86	..	4 13 0
Do. Def.	100	2	2	40 — 45	..	4 9 0
Do. Gtd. Assented	100	..	4	80 — 82	..	4 17 7
Do. 4 % Deb.	100	4	4	97 — 99	..	4 0 10
City & S. London, 5 % Pref., 1891	100	5	5	95 — 97	..	5 3 1
Do. Do. 1896	100	5	5	91 — 94	..	5 6 5
Do. Do. 1901	100	5	5	89 — 92	..	5 8 8
Do. Do. 1908	100	5	5	89 — 92	..	5 8 8
Do. 4 % Deb.	100	4	4	86 — 88	..	4 11 0
Hastings Trams, 6 % Pref.	1	6	6†	⅝ — ¾	..	8 6 8
Do. 4½ % Deb.	100	4½	4½	65 — 70	..	6 8 7
Isle of Thanet Trams, 5 % Pref.	5	2½	3	2 — 2½	..	6 0 0
Do. 4 % Deb.	100	4	4	73 — 78	..	5 2 7
Lancashire United, 5 % Deb.	100	5	5	87 — 89	..	5 12 4
London and Suburban, Ord.	1	..	..	3/16 — 5/16	..	..
Do. Do. 5 % Cum. Pref.	1	..	5†	11/16 — 13/16	..	7 5 8
Do. Do. 4½ % 1st Deb.	100	4½	4½	75 — 80	..	5 12 5

NAME.	Stock or Share.	Dividends for		Closing Quotations June 23rd.	Rise + or Fall —	Present Yield p.c.
	*	1912.	1913.			£ s. d.
London Elec. Railways, 4 % Deb.	100	4	4	90 — 92	..	4 7 0
London United Trams, 4 % Deb.	100	4	4	56 — 60	..	6 13 4
Metropolitan Railway Consol.	100	12	12	291/- — 302	+1	4 3 4
Do. Surplus Lands	100	2½	2½	59 — 61	..	4 10 4
Do. 3½ % Deb.	100	3½	3½	87 — 89	..	3 18 7
Do. 3½ % Pref.	100	3½	3½	82 — 84	..	4 3 4
Do. 3½ % Con. Pref.	100	3½	3½	79 — 81	..	4 6 4
Metropolitan District Ord.	100	Nil	..	24 — 24½	+ ½	Nil
Do. 6 % Deb.	100	6	6	138 —141	..	4 5 3
Do. 4 % Deb.	100	4	4	93 — 95	..	4 4 1
Do. 4 % Prior Lien	100	4	4	95 — 97	..	4 2 6
Do. 4½ % First Pref.	100	4½	4½	82 — 86	..	5 4 8
Do. 3½ % Gtd.	100	3½	3½	74 — 76	..	4 12 1
Metro. Elec. Trams, 4½ % Deb.	100	4½	4½	87 — 90	..	5 0 0
Do. 5 % Deb.	100	5	5	85¼ — 88¼	..	5 13 0
Potteries, Ord.	1	3½	3½	5/16 — 7/32	..	8 12 10
Do. 5 % Pref.	1	5	5	9/32 — 11/32	..	7 12 8
Do. 4½ % Deb.	100	4½	4½	81½ — 84½	..	5 6 2
South Metro. Trams, 4 % Deb.	100	4	4	66 — 70	..	5 14 4
Underground Elec. Railways	10	..	..	8¼ — 8¾	..	Nil
Do. "A"	1/-	..	..	1/16 — 1/8	..	Nil
Do. 6 % First Cum. Inc. Deb.	100	6	6	115 —117	..	5 2 7
Do. 4½ % Bonds	100	4½	4½	100 —102	..	4 8 2
Do. 6 % Income	100	6	6	90 — 91	..	6 11 10
Yorkshire (West Riding), Ord.	5	Nil	Nil	¼ — ⅜	..	Nil
Do. 6 % Pref.	5	8	4	4½ — 4¾	— ⅛	4 6 6
Do. 4½ % Deb.	100	4½	4½	85 — 88	..	5 2 3

ELECTRIC RAILWAYS AND TRAMWAYS.—COLONIAL AND FOREIGN.

Anglo-Arg. Trams, 1st Pref.	5	5½	5½	4¹³/₁₆ — 5 1/16	..	5 8 5
Do. 2nd Pref.	5	5½	5½	4 5/16 — 4 7/16	..	6 2 3
Do. 4 % Deb.	100	4	4	93 — 95	..	4 4 3
Do. 4½ % Deb.	100	4½	4½	98½—101½	..	4 8 6
Do. 5 % Deb.	100	5	5	94½ — 96½	..	5 3 6
Auckland Trams, 5 % Deb.	100	5	5	103 —106	..	4 14 3
Bombay Elec. S. & Trams, Pref.	10	6	6	11 — 11⅜	..	5 2 2
Do. 4½ % Deb.	100	4½	4½	95 — 97	..	4 12 9
Do. 5 % 2nd Deb.	100	5	5	100 —102	..	4 18 0
Brazilian Traction, Light and Power	$100	6	6†	78⅛— 80⅛	— ⅛	7 8 6
Brisbane Trams Invt., Ord.	5	8	8	6⅞— 7⅛	+ ⅛	5 8 3
Do. 5 % Pref.	5	5	5	4⅞— 5⅛	..	4 15 3
Do. 4½ % Deb.	100	4½	4½	100 —102	..	4 8 1
B. Columbia Elec. Rly., Def.	100	8	8†	109 —113	..	7 1 8
Do. Pref. Ord.	100	6	6	103 —107	..	5 12 1
Do. 5 % Pref.	100	5	5	104 —107	..	4 12 7
Do. 4½ % 1st Mort. Deb.	40	4½	4½	98 —101	+1	4 9 0
Do. 4½ % Vancouver Deb.	100	4½	4½	94 — 98	..	4 12 0
Do. 4½ % Con. Deb.	100	4½	4½	95 — 97	+ ½	4 7 8
Calcutta Trams, Ord.	5	7½	9½	6½— 7	..	6 15 9
Do. 5 % Pref.	5	5	5	5 — 5½	..	4 15 3
Do. 4½ % Deb.	100	4½	4½	98 — 101	..	4 9 0
Cape Electric Trams	1	5	5	⅝— ¾	..	6 13 4
City Buenos Aires Trams (1904)	5	5	5	5 5/16 — 5 7/16	..	4 11 11
Do. 4 % Deb.	100	4	4	93 — 98	..	4 2 6
Colombo Elec. Tr. & Lt., 5 % Deb.	100	5	5	91 — 95	..	5 5 3
Havana Elec. Rly., 5 % Bonds	$1000	5	5	93½ — 97½	..	5 2 6
Kalgoorlie El. Trams 5% A Deb.	100	5	5	82 — 87	..	5 15 0
Do. 6 % B Deb.	100	3	..	10 — 20	..	Nil

La Plata Elec. Trams, Ord.	1	..	..	⅛— ⅜	..	..
Do. Pref.	1	4½d.	..	3/16 — 5/16	..	6 5 0
Lisbon Elec. Trams, Ord.	1	6	6	1⅜— 1⅝	..	4 9 3
Do. 6 % Pref.	1	6	6	1⅝— 1 7/8	..	5 1 0
Do. 5 % Deb.	100	5	5	95 —100	..	5 0 0
Madras Elec. Tr., 6% Cum. Pref.	5	6	6	4½ — 5½	..	5 14 3
„ Elec. Tr. (1904), Deb.	100	5	5	101 —103	..	4 17 0
Manaos Trams & Lt., 1st Deb.	100	5	5	78 — 81	..	6 3 5
Manila Elec. R. and Ltg., Bonds	$1000	5	5	98½—100½	..	4 19 6
Mexico Trams Com	$100	7	7	72 — 76	..	..
Do. Gen. Con. 5 % Bonds	..	5	5	80 — 84	..	5 19 1
Do. 6 % Bonds	100	6	6	77 — 81	..	7 8 2
Para Elec. Rlys. & Lt., Ord.	5	10	10	4 — 4½	+ ⅛	11 2 2
Do. 6 % Pref.	5	6	6	4 — 4½	..	6 13 4
Do. 5 % 1st Deb.	100	5	5	86½ — 89½	..	5 11 8
Rangoon El. Tr. & Sup., Pref.	5	6	6	5 — 5½	..	5 9 1
Do. 4½ % 1st Deb.	100	4½	4½	95 — 97	..	4 12 9
Rio de Janeiro Trams, 1st Mort. & 5 % Bonds	..	5	5	100 —102	+ ⅛	4 18 0
Do. 5 % Mort. Bonds	100	5	5	90 — 92	+1	5 8 8
Sao Paulo Tram., Lt. and P. 5 % 1st Deb.	$500	5	5	96 —100	..	5 0 0
Singapore Trams, 5 % Deb.	100	5	5	88 — 92	..	5 8 8
Southern El. Tr. B.A., 5 % Deb.	100	5	5	95 — 97	..	5 3 0
Un. Elec. Trams Monte Video	5	7	7	4⅝— 5⅛	..	6 16 7
Do. 6 % Pref.	5	6	6	4¾— 5¼	..	5 14 3
Do. 5 % 1st Deb.	100	5	5	92 — 95	..	5 5 3
Winnipeg Elec. Rly., 4½ % Deb.	100	4½	4½	93½ — 95½	..	4 14 3

ELECTRICITY SUPPLY AND POWER COMPANIES.—HOME.

Bournemouth & Poole, Ord.	10	6	7	10 — 11	..	6 7 4
Do. 4½ % Pref.	10	4½	4½	9½ — 10½	+ ⅛	4 5 9
Do. Second 6 % Pref.	10	6	6	10½ — 11	+ ⅛	5 9 1
Do. 4½ % Deb. Stock	Stock	4½	4½	95 — 98	..	4 11 9
Brompton & Kensington, Ord.	5	10	10	8½ — 9½	..	5 8 1
Do. 7 % Cum. Pref.	5	7	7	8½ — 8¾	..	4 0 0
Central Electric Supply, 4 % Guar. Deb.	100	4	4	89½ — 92½	..	4 6 8
Charing Cross, West End & City	5	5	6	4⅝— 5⅛	— ⅛	5 14 3
Do. 4½ % Cum. Pref.	5	4½	4½	4⅛— 4⅜	— ⅛	4 12 4
Do. "City Undertaking" 4½ % Cum. Pref.	5	4½	4½	4⅜— 4⅝	..	4 14 9
Do. Do. 4 % Deb.	100	4	4	90½ - 92½	..	4 6 6
Chelsea, Ord.	5	5	5	4¾— 5	— ⅛	5 0 0
Do. 4½ % Deb.	Stock	4½	4½	97 — 100	..	4 10 0
City of London, Ord.	10	9	10	16½ — 17½	..	5 16 0
Do. 6 % Cum. Pref.	10	6	6	12⅜ — 13⅜	..	4 7 3
Do. 5 % Deb.	Stock	5	5	116 —120	..	4 7 4
Do. 4½ % Second Deb.	100	4½	4½	100 —103	..	4 8 1
County of London, Ord.	10	6	7	11⅜ — 12½	..	5 14 3
Do. 6 % Pref.	10	6	6	11⅜ — 12¼	— ⅛	4 18 0
Do. 4½ % Deb.	Stock	4½	4½	103 —106	..	4 5 3
Do. 4½ % Second Deb.	Stock	4½	4½	99 —102	..	4 8 1
Edmundson's, Ord.	£3	..	..	3/16 — 5/16	..	Nil
Do. 6 % Cum. Pref.	5	6	6	3¾ — 4	..	7 10 0
Do. 6 % Non-Cum. Pref.	5	..	..	1⅝ — 2	..	..
Do. 4½ % First Mort. Deb.	100	4½	4½	83 — 86	..	5 4 6
Folkestone	5	6	6	5 — 5½	..	5 9 1
Do. 4½ % First Deb.	100	4½	4½	93 — 96	..	4 14 9

Hove	5	8	9	8¾— 9	..	5 0 0
Kensington & Knightsbridge, Ord.	5	8	9	7⅜— 7⅞	..	5 14 3
Do. 4 % Deb.	Stock	4	4	90 — 92	..	4 7 0
Kent Elec. Power, 4½ % Deb.	Stock	4½	4½	76 — 80	..	5 12 0
London Electric, Ord.	8	2½	3	1¼ — 1⅝	..	5 10 7
Do. 6 % Pref.	5	6	6	4⅞— 5¼	..	5 14 3
Do. 4 % First Mort. Deb.	Stock	4	4	91 — 94	+ ⅛	4 5 1
Metropolitan	5	4½	4½	8⅜— 8⅞	..	5 16 2
Do. 4½ % Cum. Pref.	5	4½	4½	4¾— 5	..	4 10 0
Do. 4½ % First Mort. Deb.	Stock	4½	4½	98 — 101	..	4 10 0
Do. 3½ % Mort. Deb.	Stock	3½	3½	83 — 86	..	4 1 4
North Metropolitan Power Supply, 5 % Mortgages (Red.)	100	5	5	98 —101	..	4 19 1
Notting Hill, 6 % Non-Cum. Pref.	10	6	6	9⅜— 10⅝	..	5 14 3
Oxford	5	7	7	6⅞— 6⅞	+1/16	5 10 0
St. James' and Pall Mall, Ord.	5	10	12	9⅛— 9¼	— ⅛	6 9 1
Do. 7 % Pref.	5	7	7	6¾— 7⅛	..	4 16 7
Do. 3½ % Deb.	100	3½	3½	83 — 86	..	4 1 4
South London, Ord.	4	5⅛	5⅛	2⅜— 3⅛	..	6 10 4
Do. 5 % First Mort. Deb.	100	5	5	99 —102	..	4 18 0
South Metropolitan, 7 % Pref.	1	7	7	1⅛ — 1⅛	..	5 6 8
Do. 4½ % First Deb. Stock	100	4½	4½	97 — 100	..	4 10 0
Urban, Ord.	£3	Nil	..	5/16 — 7/16	..	..
Do. 5 % Cum Pref.	5	3½	4	2¾ — 3	..	..
Do. 4½ % First Mort. Deb.	100	4½	4½	83 — 86	..	5 4 8
Westminster, Ord.	5	10	10	8⅜— 8⅞	..	5 12 8
Do. 4½ % Cum Pref.	5	4½	4½	5 — 5¼	..	4 5 9

* Unless otherwise stated, all shares are fully paid. † Interim Dividend. ‡ And Funded Certs.

Continued on next page.

SHARE LIST OF ELECTRICAL COMPANIES.—*(Continued.)*

ELECTRICITY SUPPLY AND POWER—COLONIAL AND FOREIGN.

NAME.	Stock or Share.	Dividends for		Closing Quotations June 23rd.	Rise + or Fall —	Present Yield p.c.
Adelaide, 6 % Pref.	£	6	6	5⅛ — 5⅜	..	£ s. d. 5 11 7
Calcutta, Ord.	£	8½	9	7⅛ — 7⅜ xd	..	5 18 0
Do. 5 % Pref.	£	5	5	5⅛ — 5⅜	..	4 14 1
Calgary Power, 1st Mort. Bds.	100	6	6	90½ — 92½	..	5 8 0
Canadian Gen. El. Com.	$100	7	8	103 — 108	..	7 5 6
Do. 7 % Pref.	$100	7	7	118 — 123	..	5 13 10
Cordoba Lt., Power and T., Ord.	1	5	..	⅞ — 1	..	7 12 0
Do. 5 % Deb.	100	5	5	80 — 85	−8	5 17 8
Elec. Lt. and P. of Cochabamba, 6 % Bonds	100	6	6	81 — 85 xd	..	6 19 6
Elec. Supply Victoria, 5 % 1st Mort. Deb.	100	5	5	91 — 94	..	5 6 5
Elec. Dev. Ontario, 5 % 1st Mort. Bonds	$500	5	5	93½ — 95½	+ ½	5 4 9
Kalgoorlie Elec. P. and L., Ord.	10/-	Nil	..	⅜ — ⅝	..	Nil
Do. 6 % Pref.	£	6	4	⅞ — 1	..	8 0 0
Kaministiquia Power, 5 % G. Bs.	$500	5	5	101 — 104	..	4 16 2
Madras, Ord.	£	Nil	..	1¼ — 1⅝	..	..
Melbourne, 5 % 1st Mort. Deb.	100	5	5	105 — 108	..	4 12 6
Mexican El. Lt., 5 % 1st M. Bds.	..	5	•5	61 — 66	..	7 11 6
Mexican Lt. & Power, Common	$100	4	4†	45 — 48	..	..
Do. 7 % Cum. Pref.	$100	7	7	71 — 76	..	9 4 2
Do. 5 % 1st Mort. Gold Bds.	..	5	5	74 — 79	+2	6 6 7
Do. 5 % 2nd Mort. Bonds	100	5	5	59 — 64 xd	..	7 18 8

NAME.	Stock or Share.	Dividends for		Closing Quotations June 23rd.	Rise + or Fall —	Present Yield p.c.
Monterey Rly., Light & Power, 5 % 1st Mort. Deb.	* 100	1912. 5	1913. 5	51 — 55	..	£ s. d. .. ..
Montreal, Lt., H. and Power	$100	9	10†	230 —235	+4	4 5 1
Northern, Lt., Power and Coal, 5 % 1st Mort. Bonds	$500	5a	5a	10 — 20	..	.. ..
River Plate, Ord.	Stock	10	10	235 —245	..	4 1 8
Do. 6 % Non-Cum. Pref.	Do.	6	6	97 —103	..	5 16 6
Do. 5 % Deb. Stock	Do.	5	5	101 —103	..	4 17 0
Roy. Elec. Co., Montreal, 4½ % 1st Mort. Deb.	100	4½	4½	100 —102	..	4 8 8
Shawinigan Water, Capital	$100	5½	6	135 —139	+3	4 6 3
Do. 5 % Con. 1st Mort. Bonds	$500	5	5	107 —109	..	4 11 7
Do. 4½ % Per. Deb.	Stock	4½	4½	99½ —101½	..	4 8 8
Toronto Power, 4½ % 1st Deb.	Do.	4½	4½	96 — 98	..	4 12 0
Vera Cruz Lt., P. and T., 5 % 1st Mort. Deb.	100	5	5	85 — 87	..	5 15 0
Victoria Falls Power, Pref.	1	6	6	⅛ — ¼	..	8 0 0
West Kootenay Power and Lt., 1st Mort. 6 % Gold	100	6	6	103 —105	..	5 14 8

MANUFACTURING COMPANIES.

Aron, Ord.	£	7	7	1⅛ — 1⅜	..	8 12 4
Do. 6 % Pref.	£	6	6	⅞ — 1	..	6 17 2
Babcock & Wilcox	£	16	16	2⅞ — 3	..	5 6 8
Do. Pref.	£	6	6	1⅛ — 1⅜	..	4 7 6
British Aluminium, Ord.	£	..	5	1⅝ — 1¾	..	4 14 1
Do. 6 % Cum. Pref.	£	6	6	2⅝ — 2¾	..	6 9 0
Do. 5 % Prior Liens Debs.	100	5	5	97 —100	..	5 0 0
Do. Deb. Stk.	100	5	5	90 — 95	..	5 5 3
B.I. & Helsby Cables	£	10	13	9⅜ — 9⅞	..	6 11 8
Do. Pref.	£	6	6	5⅞ — 6⅛	..	4 14 1
Do. Deb.	100	4½	4½	101 —104	..	4 6 9
British Thomson-Houston, Deb.	100	4½	4½	92 — 94	..	4 15 9
British Westinghouse, Pref.	£	Nil	5	1⅝ — 1⅞	..	5 6 8
Do. Deb.	100	4	4	74 — 76	..	5 5 3
Do. 6 % Prior Lien	100	6	6	101 —104	..	5 16 6
Browett, Lindley, Ord.	£	..	..	2/- —3/-	..	Nil
Do. Pref.	£	..	..	8/- —8/6	..	Nil
Brush, 7 % Pref.	£	Nil	..	0 — ¼	..	Nil
Do. 5 % Prior Lien Deb.	100	5	5	82 — 87	..	5 15 0
Lo 4½ % Deb.	100	4½	4½	52 — 57	..	7 17 10
Do. 4½ % Second Deb.	100	4½	4½	81 — 85	..	12 17 2
Callender's Cable	£	15	15	11⅞ — 12⅛	..	6 3 8
Do. Pref.	£	5	5	5⅜ — 5⅝	..	4 13 0
Do. Deb.	100	4½	4½	97 —100	..	4 10 0
Casiner-Kellner	£	20	20½	24 — 25	+⅛	8 11 5
Do. Deb.	100	4½	4½	104 —107	..	4 4 1

Dick, Kerr	£	Nil	..	⅜ — ⅝	..	..
Do. Pref.	£	6	6	⅛ — ⅜	..	6 17 2
Edison & Swan, A, £2 paid	£	Nil	..	0 — ⅛	..	Nil
Do. fully paid	£	Nil	..	1 — 1⅛	..	Nil
Do. 4 % Deb.	100	4	4	58 — 62	..	6 9 1
Do. 5 % Second Deb.	100	5	5	61 — 66	..	7 11 6
Electric Construction	£	5	6	⅜ — ⅝	..	8 14 6
Do. Pref.	£	7	7	1⅛ — 1⅜	..	6 4 5
Greenwood & Batley, Pref.	£	10	7	6⅞ — 7⅛	..	9 13 2
Do. Deb.	100	5	5	92 — 94	..	5 6 5
General Electric, 6 % Pref.	£	10	6	10⅜ — 10⅝	+⅛	5 11 9
Do. Deb.	100	4	4	87 — 91	..	4 8 0
Henley's, Ord.	£	15	20	14½ — 15½	..	6 9 0
Do. Pref.	£	4½	4½	4⅞ — 5⅛	..	4 7 10
Do. Deb.	100	4½	4½	99½ —101½ xd	..	4 8 8
India-Rubber, G. & T.	£	7½	7½	9⅞ — 10⅛	..	6 19 5
Do. Pref.	£	5	5	8½ — 9⅜	..	5 5 3
Telegraph Construction	£	20	20	26 — 28	..	6 6 2
Do. Deb.	100	4	4	98 —100	..	4 0 0
Willans & Robinson, 4 % 1st Mort. Deb.	100	4	..	63 — 67	..	5 19 8
Do. B 4 % Cum. Pref.	100	..	£1	40 — 44	..	9 1 10

TELEGRAPH AND TELEPHONE COMPANIES.

Amazon Telegraph	£	4½	4½	5⅝ — 6⅛	..	7 4 0
Do. 5 % Deb. Red.	Stock	5	5	95 — 98	..	5 2 0
American Telep. & Teleg., Cap.	$100	8	8	124 —128	..	6 5 0
Do. Collat. Trust	$1000	4	4	92 — 95	..	4 4 3
Anglo-American Telegraph	Stock	8	8	64 — 67	..	4 9 7
Do. 6 % Pref.	Do.	6	6	107⅛ —108½	— ⅛	5 10 7
Do. Def.	Do.	80/-	80/-	22⅝ — 23½	— ¼	6 9 0
Anglo-Portuguese Tel., 5 % Mort. Deb.	100	5	5	102 —104	..	4 16 2
Chili Telephone	£	8	6†	7⅛ — 7⅜	..	5 6 8
Commercial Cable, Stlg. 4 % Deb.	Stock	4	4	79 — 81	..	4 18 9
Cuba Telegraph	£	10	6†	8 — 9	— ½	6 13 4
Do. 10 % Pref.	£	10	10	16 — 17	..	5 17 8
Direct Spanish Telegraph, Ord.	£	5	4	3¾ — 4	..	5 0 0
Do. 10 % Cum. Pref.	£	5	10	10	..	6 9 0
Direct United States Cable	£	10	4	6⅜ — 6⅝	..	5 16 4
Direct W. India Cable, 4½ % Reg. Deb.	100	4½	4½	98 —100	..	4 10 0
Eastern Telegraph, Ord. Stock	Stock	7	7	129 —132	..	5 6 8
Do. 8½ % Pref. Stock	Do.	8½	8½	77 — 79	..	4 8 9
Do. 4 % Mort. Deb.	Do.	4	4	94½ — 96½	..	4 3 0
Eastern Extension	£	10	7	12⅜ — 13	..	5 7 9
Do. 4 % Deb.	Stock	4	4	95 — 97	..	4 2 6
Globe Telegraph and Trust	£	10	6†	11 — 11½	..	5 4 4
Do. 6 % Pref.	£	10	6	12⅜ — 12⅝	..	4 15 4
Great Northern Telegraph	£	20	20	31½ — 33½	..	5 19 5
Indo-European Telegraph	£	25	18	56½ — 58½	..	5 11 1
Mackay Companies Common	$100	5	5	80 — 85	..	5 17 8
Do. 4 % Cum. Pref.	$100	4	4	67 — 72	..	5 11 1

Marconi's Wireless Telegraph	£	20	20	7⅞ — 8⅛	+ ⅛	6 3 1
Do. 7 % Cum. Partic. Pref.	£	17	..	2⅜ — 2⅝	+ ⅛	6 1 0
Monte Video Telephone, Ord.	£	6	6	1⅝ — 1¾	..	6 8 0
Do. 5 % Pref.	£	5	5	⅞ — 1	..	5 18 6
New York Telep., 4½ % Gen. Bnds.	100	4½	4½	100 — 101	..	4 9 0
Oriental Telep. and Elec.	£	10	10	2⅛ — 2⅜	..	4 7 6
Do. 6 % Cum. Pref.	£	6	6	1⅜ — 1⅝	..	4 18 5
Do. 4 % Red. Deb.	Stock	4	4	87½ — 89½	..	4 9 5
Pacific and European Tel., 4 % Guar. Debs.	Do.	4	4	98 — 100	..	4 0 0
Reuter's	£	10	7	7½ — 8½	..	8 4 8
Submarine Cables Trust	Cert.	6	6	126 —129	..	4 13 7
Telephone Co. of Egypt, 4½ % Deb. Red.	Stock	4½	4½	98 — 100	..	4 10 0
United River Plate Telephone	£	8	6†	6⅛ — 6⅜	..	5 18 5
Do. 5 % Cum. Pref.	£	5	5	5⅛ — 5⅜	..	4 9 0
West Coast of America	£	2½	2½	N — ⅛	..	Nil
Do. 4 % Debs., 1 to 1,500 guar. by Bras. Sub. Tel.	100	4	4	96 — 99	..	4 0 10
West India and Panama Teleg.	£	1⅛	1⅛	1 7/16 — 1 9/16 xd	..	7 8 2
Do. 6 % Cum. 1st Pref.	£	6	6	9 — 9½ xd	..	6 6 4
Do. 6 % Cum. 2nd Pref	£	6	6	8¼ — 8½ xd	..	6 16 9
Do. 5 % Debs.	100	5	5	97 — 99	..	5 1 0
Western Telegraph, Ltd.	£	7	7	18½ — 19½	..	5 1 11
Do. 4 % Debs.	Stock	4	4	£6 — 98	..	4 1 8
Western Union 4½ % Fdg. Bonds	$1000	4½	4½	94 — 97	..	4 12 9

* Unless otherwise stated all shares are fully paid. † Interim dividend. a Paid in deferred interest warrants.

Bank rate of Discount 3 per cent., January 29th, 1914.

Reason Exhibit at Birmingham.—An interesting little exhibit of meters, switches, &c., was held at the Queen's Hotel, Birmingham, during the recent M.E.A. Convention, by the Reason Manufacturing Co., Ltd. The object was to demonstrate particularly the great improvement recently introduced in the construction of these meters, which in the older types would, with violent vibration, over-register by the mercury shaking down the tube. The new tubes are provided with a simple spring suspension and were quite unaffected, though mounted on a mechanically vibrated base. The new meters are well finished, and we understand are coming into favour again with central station authorities, being, of course, specially adapted for registering the very small currents required by the modern high-efficiency lamp, which motor meters often fail to register. Various hand and electrically-wound time switches were also shown; also a new half-watt lamp fitting, and a new type of drum controller and starter which the company is now standardising, and in which a special spring operated type of finger is employed. We gather that the company proposes to make this exhibit an annual fixture.

A Canadian Court and the Code.—Justice Mercier, of Montreal, has decided that an electrical contractor is not bound to do his work in compliance with the regulations of the insurance companies unless it is so stipulated in his contract. The Routtenberg Co. ordered a $400 electric sign from the Macey Sign Co., but when it was delivered they refused to pay for it, claiming that the wiring was not up to the Underwriters' standard. The Court held that the sign had been made in accordance with all the requirements of the contract, and that therefore payment must be made. —*Canadian Electrical News.*

EXPORTS AND IMPORTS OF ELECTRICAL GOODS DURING MAY, 1914.

THE returns of electrical export and import business for the month of May show considerable improvement in all sections as compared with the preceding month.

The export total of £618,354 is the highest so far recorded this year, and compares with £485,534 in April. Although it contains a fairly large telegraphic export, valued at £172,099, the remaining business, totalling over £446,000, was above the normal, due to the improvement in machinery and telephonic exports.

The imports total of £290,878 also compares favourably with the £273,205 recorded in the preceding month; the increase is traceable, as in the case of the exports, to improved business in machinery, and telephonic and telegraphic materials. While cable exports were practically stationary, a slight increase occurred in the value of cable imports.

The re-exports, valued at £31,102, reached almost the highest figure recorded during 1914.

Our best customer during the month was Canada, this being due to a telegraphic purchase valued at some £86,000; it may be noted that Japan's comparatively high total was due to a similar cause, while India's total of over £69,000 represents fairly normal trade.

The position of the importing countries shows no particular alteration as compared with the previous month.

Registered Exports of British and Irish Electrical Goods from the United Kingdom.

Destination of exports and country consigning imports.	Electrical goods and appliances.	Wires and cables rubber and other insulations.	Electric lighting fittings and accessories.	Electric glow lamps.	Electric arc lamps and lamp parts.	Electric meters and instruments.	Electric machinery.	Electrically-driven machinery.	Batteries and accumulators.	Carbons.	Telephonic cable and apparatus and electric bells.	Telegraphic cable and apparatus.	Total.
	£	£	£	£	£	£	£	£	£	£	£	£	£
Russia, Sweden, Norway and Denmark ...	1,729	215	462	78	70	580	6,932	304	...	131	309	1,586	12,396
Germany	2,298	5,996	87	...	339	138	1,639	...	...	33	...	264	10,794
Netherlands, Java and Dutch Indies ...	367	784	457	...	37	8	2,417	759	37	...	139	140	5,145
Belgium	1,106	...	126	31	44	25	2,666	140	235	...	2,944	53	7,370
France	595	...	3,001	...	...	...	9,903	37	114	39	172	46	13,907
Portugal	69	83	68	128	...	...	163	3,594	...	10	676	10	4,801
Spain, Canary Isles and Spanish N. Africa...	1,420	58	2	...	130	121	5,918	...	26	95	155	119	8,044
Switzerland, Italy and Austria-Hungary ...	737	59	53	31	118	32	6,607	28	...	390	...	1,168	9,223
Greece, Roumania and Turkey	541	489	227	...	...	...	704	256	46	...	1,796	1,902	5,961
Channel Isles, Gibraltar, Malta and Cyprus...	116	...	47	29	...	3	438	10	284	...	2,108	64	3,099
U.S.A., Philippines and Cuba	302	...	72	35	...	8	197	...	73	91	...	1,348	2,126
Canada and Newfoundland	727	4,940	1,060	1,507	236	1,740	16,644	415	1,970	4	419	86,479	116,141
British West Indies and British Guiana ...	114	104	56	69	...	...	337	...	5	10	13	20	728
Mexico and Central America	...	...	...	...	...	...	...	...	...	...	...	...	...
Peru and Uruguay	77	...	53	127	...	...	724	312	8	183	30	132	1,646
Chile	215	70	178	78	37	...	691	64	...	...	70	747	2,150
Brazil	1,242	972	723	173	...	13	3,104	5,164	636	39	253	1,738	14,057
Argentina	6,272	8,426	166	914	121	104	18,359	348	1,616	227	758	4,156	41,467
Colombia, Venezuela, Ecuador and Bolivia...	226	180	112	...	...	4	1,399	290	...	...	269	11	2,491
Egypt, Tunis and Morocco	215	537	75	24	...	73	685	6	31	...	44	397	2,087
British West Africa	53	316	153	76	...	32	366	...	...	11	16	27	1,050
Rhodesia, O.R.C. and Transvaal	1,818	3,352	529	1,371	51	21	7,493	...	367	...	319	865	16,186
Cape of Good Hope	2,383	2,811	458	873	218	469	28,489	494	496	...	6,801	4,224	47,716
Natal	1,192	18,081	224	135	37	...	3,298	...	922	35	111	474	24,509
Zanzibar, Brit. E. Africa, Mauritius & Aden	260	140	74	143	42	555	65	22	13	11	13	874	2,212
Azores, Madeira and Portuguese Africa ...	177	399	172	143	460	11	1,393	...	12	...	118	202	3,087
French W. Indian Islands and Madagascar	...	...	...	...	...	...	380	...	...	...	...	12,785	13,165
China and Siam	1,281	1,419	510	117	...	40	5,413	62	248	...	51	465	9 606
Japan and Korea	1,200	44	319	...	68	861	20,952	1.289	3,090	20	30	38,126	65 999
India	3,398	7,798	3,106	1,661	56	2,177	33,364	8,078	5,534	247	501	3,678	69,598
Ceylon	131	121	89	14	30	5	208	787	460	8	451	11	2,315
Straits Settlements, Fed. Malay States and Sarawak	668	3,247	261	18	15	731	3,093	254	289	98	3,056	403	12,133
Hong Kong	221	354	189	59	...	615	1,797	...	14	...	615	2	3,866
West Australia	472	721	43	395	...	327	1,174	...	180	...	9	31	3,352
South Australia	187	651	167	28	239	282	1,665	...	93	...	5,107	1,251	9,670
Victoria	1,938	4,867	374	1,619	161	2,251	3,028	411	849	21	1,070	911	17,500
New South Wales	2,026	9,805	673	1,392	249	571	6,510	343	864	...	2,659	2,389	27,481
Queensland	217	41	27	264	...	103	1,315	...	245	...	4,275	1,251	7,738
Tasmania	388	...	...	54	90	...	...	...	...	...	703	...	1,235
New Zealand and Fiji Islands	1,153	1,741	512	382	202	350	6,469	464	500	...	780	3,750	16,303
Total, £	37,531	78,821	14,905	11,968	3,050	12,250	205,999	23,931	19,257	1,703	36,840	172,099	618,354

Registered Imports into the United Kingdom of Electrical Goods from all Countries.

Russia, Norway, Sweden and Denmark ...	1,475	...	...	12	...	...	4,129	303	713	38	15,322	21,992
Germany	5,359	24,790	2,144	8,294	6,224	3,304	94,290	576	4,115	9,621	9,013	167,730
Netherlands	28	...	30	107	647	80	10	...	187	...	...	1,089
Belgium	336	4,857	...	57	107	5	6,314	...	239	96	3,465	15,476
France	765	945	422	1,477	193	875	1,669	...	510	4,296	1,020	12,172
Switzerland	264	1,131	349	20	...	826	3,358	...	...	313	281	6,542
Italy	...	4,281	...	...	...	...	25	...	...	...	...	4,306
Austria-Hungary	62	878	98	191	...	...	46	...	...	307	54	1,636
United States	5,196	60	1,331	3	461	301	24,663	23,259	2,058	1,134	1,098	59,564
Total, £	13,485	36,942	4,374	10,161	7,632	5,391	134,504	24,138	7,822	15,805	30,253	290,507

Additional imports: Spain, carbons, £144. Portuguese East Africa, machinery, £27. Canada, electrical goods, £55; fittings, £50; meters, £5; machinery, £90.

Registered Re-Exports of Foreign and Colonial Electrical Goods from the United Kingdom.

Various countries, mainly as above... ...	20,622	903	...	1,209	204	...	7,026	...	481	226	431	31,102

TOTAL EXPORTS: £618,354 TOTAL RE-EXPORTS: £31,102 TOTAL IMPORTS: £290,878

NOTE.—The amounts appearing under the several headings are classified according to the Customs returns. The first and third column contains many amounts relating to "goods" otherwise unclassified, the latter, doubtless, consisting of similar materials to those appearing in adjacent columns. Imports are credited to the country whence consigned, which is not necessarily the country of origin.

THE MUNICIPAL ELECTRICAL CONVENTION.

IN our last issue we referred briefly to the opening day's proceedings of this year's Convention at Birmingham.

The morning's gathering took place in the theatre of the Midland Institute, and we cannot pass over the occasion without referring to the curious blend of illumination and no less of architecture found in the building; even Ald. Bowater, the Deputy Lord Mayor, who at the subsequent luncheon appealed to the visitors not to trouble about reducing the cost of fittings, can have felt no anxiety as regards the examples found in this hall.

It was a foregone conclusion that Mr. Vignoles's paper of the morning would meet with general appreciation, commercial development being an indispensable factor to success at the present day, and it appears to be only a question of how much to spend in this direction. As mentioned in our last issue, a feature of the afternoon was the electric vehicle display outside the G.E.C. works at Witton. Four of the vehicles were shown by Edison Accumulators, Ltd., including a passenger roadster, M.A.B. ambulance, and ½ and 2-ton vehicles of the commercial type; the Torpedo Co. had on view a ½-ton van and a passenger roadster, and the General Vehicle Co. (New York) a ½-ton van and 2-ton wagon; two Lloyd "electrics" for ¼-ton and 2½ tons loads were shown; and a new-comer, Messrs. W. A Stevens, of Tilling-Stevens fame, had on view a 3-ton delivery wagon, equipped with a Tudor battery. Another new entrant, not on the official list, was an electric car equipped with a Naylor battery, which, we were told, had on the previous day journeyed from London.

On Wednesday morning, Coventry was visited by special train, the members being welcomed in the historic St. Mary's Hall by the Mayor.

Mr. Fedden's paper on the "Design and Operation of Modern Boiler House Plant," which we print in abstract in this issue, drew a long discussion, the subject being of increasing importance owing to the scale on which power production will be carried out in the near future, and the difficulties which will arise in handling fuel and ashes in large quantities, not to mention the added complications which may be introduced with gas firing and by-product recovery. Some engineers appear to favour a short cut to simplicity by the purchase of gas in bulk from those whose business it is to make gas.

This would remove the fuel and ash problem, which, however, is only acute in a congested area; it would also enable the engineer and manager to devote his attention to the production and disposal of electricity, which is a much more potent argument, and it might result in an arrangement mutually beneficial to gas and electricity suppliers.

Dr. Ferranti admitted the attraction of such an ideal arrangement, but felt that gas making processes would have to be revolutionised for it to come about. Nevertheless, it seems to us that the problem is one with which the gas industry would not hesitate to grapple if it saw any advantage therein.

After the luncheon interval, when the visitors were entertained by the Mayor, the afternoon was given up to visits to the Coventry electricity works, and the establishments of the Daimler Co., Messrs. Willans & Robinson, and the British Thomson-Houston Co., the two last named necessitating a journey to Rugby. Having referred to the other works in a previous issue, we may briefly mention that the visitors to the B.T.H. works were shown turbo-generators ranging from quite small sizes to 6,000-KW. output in course of construction, also numerous rotary converters for English railways, traction motors for the Argentine railways, and other plant; a feature of particular interest was the new machine bays, 600 ft. long, constructed in ferro-concrete, which are being equipped with individually-driven tools. The visitors were also permitted to view a section of the lamp works, which, we believe, have never previously been thrown open for inspection, and, thanks to the courtesy of the company's officials, a somewhat arduous hour and a-half's pilgrimage retains many pleasant and instructive recollections.

It may be added that the company has 48 turbine sets and 87 rotaries going through the shops, nearly 60 of the rotaries being in 1,000-KW. to 1,500-KW. sizes.

Returning to Birmingham, the visitors were entertained in the evening to a reception and dance by the Lord Mayor and Lady Mayoress.

Thursday was a most strenuous day, especially to those who enjoyed to the full the hospitality of the Lord Mayor on the previous evening, as a comparatively early start was made for Stratford-on-Avon, the journey being accomplished in motor-vehicles, along roads which appeared to be innocent of tar macadam.

Here, in the Memorial Lecture Room, after a civic welcome reminiscent of the Shakesperian atmosphere of the locality, Mr. Horace Bowden's paper on "The Standardisation of Tariffs" was outlined by the author and discussed. Mr. Bowden takes considerable objection to the assessment system largely on account of what we may call its inexact character as regards individual electrical demands.

His own ideal tariff, however, appears to depend on assumptions and estimates based on local conditions, as some of his audience reminded him. It is probable that no standard system of tariffs can be evolved which will meet the requirements of all undertakings; conditions differ so greatly. This striving "to make the punishment fit the crime" reminds us of the man who figures out works costs to the third place of decimals and yet cannot vouch for the accuracy of his meters.

The discussion was a long one, and we need only record Mr. Wordingham's satirical comment, "Ha! Ha!" to the author's phrase, "Municipal enterprise is governed by the laws of equity."

At the conclusion of the meeting the visitors adjourned to the Town Hall for luncheon. Stratford-on-Avon possesses many attractions, not the least of them being a certain veal and ham pie, as many of the visitors discovered; as to the others, we can say very little, as shortly after lunch the party left in motor vehicles for Warwick, where time was allowed for the inspection of the Castle and grounds, and for the inevitable official photograph which we reproduce. Subsequently the journey was continued to Birmingham, the travellers catching a fleeting view of the ruins of Kenilworth on the way.

In the evening the Birmingham Entertainments Committee had provided for its guests what proved to be a highly-successful open air *fête* and concert at the Botanical Gardens at Edgbaston. Charmingly illuminated grounds, vocal and instrumental music, and an excellent display of fireworks held the attention of the visitors until a late hour, and even then the indefatigable members of the "Point Five" Association contrived on their return to the Grand Hotel to hold a meeting which lasted well into the morning.

For many of the visitors Friday marked the close of a busy week.

The annual general meeting was held in the morning, when Mr. Harry Richardson, of Dundee, was duly elected president for the coming year, the venue of the 1915 convention being, however, not definitely stated. Resolutions of sympathy with Mrs. Bruce Anderson and the B.E.A.M.A., and of thanks to those who had provided so lavishly for the entertainment of the Association and its friends were passed.

An incident of the meeting was a resolution moved by Mr. Seabrook, "on his own," as he said, giving expression to the regret of the members at the dissolution of the Industrial Committee of the I.E E.; although this resolution was subsequently withdrawn, the later resolution moved by Mr. Vignoles, for the appointment of a special committee of the M.E.A. to deal with any matters for furthering the supply and use of electricity from public mains, with powers to co-opt outside representatives, as in the case of the Electric Vehicle Committee, was passed by a large majority.

The proceedings closed with a vote of thanks to the President, Mr. R. A. Chattock, than whom no President has merited greater appreciation for the services which he has rendered.

In the afternoon the Summer Lane generating station was thrown open for inspection, and a demonstration of the Taylor frequency changer was given at the Dale End headquarters, while the Entertainments Committee provided a Cinderella Dance at the Grand Hotel in the evening. Those of the visitors who stayed overnight had an opportunity of travelling to Worcester on Saturday, where arrangements were made for visiting the Royal Porcelain Works, the Powick hydro-electric station and other points of interest.

The Birmingham Convention will remain as an example of organised and kindly hospitality on which the local Entertainments Committee and all concerned are to be congratulated. If anything, the visitors were too well looked after, and to some at least, an ordinary day's work will provide a welcome rest.

Looking back over a dozen or so conventions, it is apparent that very great changes have taken place. The Association, of course, takes itself much more seriously than of old as befits its greater responsibilities and the grey hairs of its members.

The essentially engineering occupations and problems of its then young members have been largely displaced, or at any rate obscured by the more pressing, and possibly more profitable commercialism, which affects electricity equally with any other product of to-day.

In a word, its young hopefuls have developed into successful business men, and it would be idle to deny that their prosperity is in no small degree due to the spirit of camaraderie fostered by the Association in municipal circles. Even greater changes are apparent in the annual conventions, which from being the event of the year to the Association, have become, as one speaker said, an incident in the year's work—and this, it may be added, of a rather more than less social character, since the ladies began to take so kindly an interest in electrical matters.

Whether this change is all to the good of the Association and its members is a moot point; to the great majority of the latter the "incident" remains the one convenient opportunity during the year when they can forgather as a body, and, highly successful as the last Convention has been, both as regards its business and its pleasure, it is possible that a good many members look back with appreciation, not unmixed with regret, to the less formal, less strenuous, but no less enjoyable meetings, when, with more leisure at his command, mere man contributed so successfully to the entertainment of the hour.

Some Notes on the Commercial Development of Electricity Supply in Moderate-sized Towns.

(Discussion on Paper by W. A. VIGNOLES, *Chief Electrical Engineer, Grimsby. For abstract of paper see page* 1023*).*

MR. FRANK AYTON (Ipswich), in opening the discussion, referred to the importance of development work. In Ipswich they had been advertising for 10 years, but could trace very little result until the last few years; this pointed to the necessity for sustained effort in publicity work. Tramcar advertising had proved very valuable, and the type of notice containing few words had excited most interest. It was a mistake to give the consumer lengthy pamphlets and he believed in the mail card system. The expenditure in Ipswich last year on advertising was just over £140. During seven years they distributed nearly 23,000 notices, &c., through the post, and the average yearly increase of the connected load was 19 per cent., and of the sales 22 per cent. over that period. He agreed with the author as to the need for a development committee. In Ipswich they had their own sales department, but quite recognised the good work of local contractors. He hoped the author would see his way to put a resolution before the members in regard to the suggested committee, which was particularly necessary in view of the practical withdrawal of the representatives of the M.E.A. from the Publicity Committee, this action being due to the lack of support afforded by provincial undertakings.

MR. A. H. SEABROOK (Marylebone) urged the importance of municipal suppliers sticking to their selling and hiring powers or getting them; rather than give them up, he suggested that any profits made by sales should be pooled for the benefit of the electrical firms in the area. This would prove that municipal undertakings were not trying to rob private enterprise of its profits, but were working for the good of all. The I.M.E.A. was a splendid co-operative movement, and he supported the suggested committee, which he hoped would materialise. He concluded by referring to the ill-fated Industrial Committee of the Institution of Electrical Engineers, and the apathy of the members of that Institution in not taking up the matter with the Council, in view of the feeling that some such organisation was wanted. The year would be a prominent one, if only it marked the formation of a development committee on comprehensive lines.

MR. S. E. FEDDEN (Sheffield) took exception to the author's views on exhibitions; in his city they took every opportunity to exhibit electrical apparatus and demonstrate it to the public. The trouble in Sheffield was how to effect sales through the contractor. From experience he favoured fixing the price of energy beforehand, having regard to the business to be done. This policy during 10 years in Sheffield had resulted in increasing the sales for power purposes from 2 million to 26 million units. People were now so well acquainted with electric motors, that they were rarely called on to hire them out, as in former years. It was better to make the mistake of laying mains too large than too small; he usually had a spare duct laid in streets to provide for the heating and cooking load of the future. They had houses with 17 to 20 KW. installed, and, if the business developed on these lines, it would be necessary to run a H.T. supply for heating and cooking. Lighting was a by-product and advertising agent; they lost on some small consumers, but it advertised and extended the supply. For heating he found that 2 KW. was a minimum now, and often 3 and 4 KW. fires were installed, which it was a real pleasure to use. The four-light radiator was a back number. Cookers could be hired out at 4s. 6d. per quarter, and electrical cooking would compete with gas at only 1s. 6d. per 1,000 cb. ft. in Sheffield; he had recently sent out two dozen such cookers, but a hiring rate of 15s. per quarter was useless.

MR. E. E. HOADLEY (Maidstone) urged on members the advisability of taking powers for hire and hire-purchase, which they could get, and leaving the fuller powers sought for the future. It was very well to sell energy at ½d. per unit, but the cost of the electrical stove was prohibitive as compared with the facilities for obtaining gas stoves. It was worse to supply unprofitable flat-rate lighting consumers, as a matter of expediency, than to supply energy at ½d. per unit for cooking. In Maidstone they encouraged the contractors and found practically all their work for them, by means of the canvassing organisation, &c.

MR. ALEX. CRAMB (Croydon) supported the use of showrooms, which he had found very valuable. There was nothing meritorious in small publicity expenditure; if the mains were in and waiting to be loaded up, development work was well worth paying for, and he expended over £1,100 a year in this way. He felt that some central publicity organisation was absolutely essential, but financial support was necessary to success. They should concentrate on getting their Bill through Parliament and then they would be able to subscribe to a suitable organisation, and do better work than the gas people. They had heard too much of the electrical contractor during the last few years; contractors were a valuable asset to the undertaking, they supported the work of the electricity department, and must be assisted as far as possible. He felt that the Contractors' Association had not dealt fairly with them, however, and that the M.E.A. must stick to its Bill.

ALD. FRED. SMITH (Liverpool) commented on the value of the paper, but disagreed with a view put forward in the meeting that one Committee could rob another Committee of its profits. He urged a broad view of municipal work, and caused some amusement by his declaration that he had "sat on" the Liverpool electricity undertaking ever since it was bought over. He would be no party to any pooling arrangement with contractors; the latter worked for themselves, but he worked for the Corporation.

BAILIE WILLOCK (Glasgow) twitted the previous speaker with taking the electricity profits to run the police, street cleaning, &c., departments. In Scotland each department had to work by itself, and there was no disguising the results of one section of municipal work by money taken from another section.

MR. HORACE BOWDEN (Poplar) agreed with the author that a consumer would pay more for electricity than gas if he wanted the former, and it was practicable to supply at a competitive price. There was no considerable profit on public lighting, but they did not want to make large profits. He considered 5s. per quarter a suitable hire charge for electric cookers, and at Poplar they bought satisfactory electric cookers at £6 to £7 each.

COUNCILLOR CROWTHER (Sheffield) urged the necessity of using profits for the development of the undertaking; it was of far more importance to give cheap power in Sheffield than to reduce the rates. He was willing to work with the contractor, but not with his hands tied.

The author briefly replied to the discussion, and the meeting adjourned.

Design and Operation of Modern Boiler-house Plant.

(Abstract of paper read by S. E. FEDDEN, *Past President, Chief Electrical Engineer, Sheffield.)*

THE main points to consider in the laying down of a steam-driven power station, are

(1) Adequate supply of water for condensing purposes.
(2) Ample facilities for dealing with ashes.
(3) Good accommodation for getting in and storing coal.

No 2, however, is becoming a very serious source of expense and concern in large cities, because of the difficulty of obtaining tips within a reasonable distance of the station. In Sheffield the cost of carting has increased no less than forty per cent. within the last few years. The author has lately gone to considerable expenditure to deal with ashes.

A lease of a valley adjacent to the power house has been obtained and a steel bridge erected for guard purposes over the main line of railway. A ropeway 200 yards long has been installed, capable of dealing with twenty tons of ashes per hour. This method of dealing with the ashes was arrived at after investigating the undermentioned alternative schemes, which worked out as follows:—

		s.	d.	
Disposal of Ashes	Railway	2	9½	per ton.
	Cartage	1	11	,,
	Ropeway	1	3	,,

No. 3. Dealing with the facilities for getting in coal it is advantageous to choose a site having a high level siding, so that the trucks come in straight off the railway over the top of the bunkers, thereby doing away with the expense of installing and running coal conveyors.

Needsend power-house is arranged on this plan, and the author had to cut sheer down sixty feet and excavate approximately 30,000 cubic yards of material. However, it was found that the material was suitable for brick making. The author, therefore, built three kilns, which were used for providing bricks for building a permanent kiln and chimney. A large portion of the material was converted into bricks for the power house; other portions of the excavations were found to be good hard rock, suitable for concrete and wall building, and the foundations were excellent. The expensive looking site, therefore, turned out to be a cheap one as regards capital cost, and is proving itself most convenient and economical in maintenance and running charges. The capital cost per KW. for the first section of the station is below £10, including the cost of land and sidings.

The present equipment of the boiler house consists of eleven water-tube boilers, three more boilers being under construction. Provision is made for a three weeks' supply of coal opposite each boiler on the siding level, and each boiler has a shoot holding about 100 tons of coal, which feeds by gravity into the mechanical stoker hopper. Bottom-emptying trucks are brought directly over these shoots, and the major portion of the coal is never handled from the time of putting it in the trucks at the colliery until it is taken hold of by the mechanical stokers.

At the ends of the five railway lines over the top of the bunkers means had to be provided for the transference of the railway trucks from one line to the other, and in this connection the author has obtained an exceedingly useful and satisfactory traverser. It is electrically driven by means of an 8 H.P. two-phase motor.

The shoots are fitted with measuring chambers and indicating gear, and the coal is led through breeches pieces to the stoker hoppers. It is frequently claimed that measuring chambers are most inaccurate, but the author contends that this is not so.

Many engineers argue that warming water by live steam is economical and saves coal, but that has never been proved to the author, although he concedes that any loss incurred by heating the feed water by live steam is amply repaid in the saving of repairs to the economiser and boiler tubes, and therefore is a saving of capital expenditure which would otherwise be required for extra economisers and boilers as spares. The author supports this contention from actual experience. The live steam feed-water heaters which the author has had in use with satisfactory results for some years have been those fitted with a patent indented tube.

The ash disposal arrangements should be such that the ashes can be lifted from two or three points in the ashes trench, and it is well not to be absolutely dependent on mechanical plant; openings should be left in the boiler-house floor, covered with plates, so that the ashes can in an emergency be taken away by carts.

At Neepsend the ashes are elevated to an overhead hopper and taken away to the tip ground by a bucket ropeway, which automatically tips the ashes wherever required.*

The automatic return terminal is mounted on eight steel wheels running on a pair of rails, so that as the ground around is filled up in course of time by the tipping, the terminal itself can be moved along. In this way the whole installation can be moved round fanwise for a total length of 190 feet, so that in time the whole of the low ground to the left of the ropeway will be automatically filled up. The whole of the hauling rope sheaves are mounted on roller bearings, and only occasionally require lubricating.

The whole installation, including the loading and despatch of the carriers, is worked by one man, so that the cost of disposing of the ashes is exceedingly small.

An additional shoot has been connected to the hopper, so that in the event of a breakdown of the ropeway a railway truck can be run under this shoot to give an alternative means of getting rid of the ashes.

A suction plant is about to be put in for all new boilers, and eventually for the old ones, by which the author expects to save considerable labour, and also do away with much dirt and dust, besides causing the atmosphere in the ashes trench to be less vitiated by the fumes; it will serve also to clean soot from soot chambers and economisers, thus reducing the amount of manual labour.

As to the type of boiler to be used, very little can be said; only water-tube boilers are suitable. The author is in favour of the vertical tube boiler, having experienced very good results from this type. The aim of all engineers is to get the maximum evaporation out of the smallest floor space. This means a large grate area and the burning of as much coal as possible per square foot of grate area.

The author considers with his present knowledge that the best over-all efficiency and least maintenance cost is obtained by running the following combination:—

> Water-tube boilers; economiser; chain-grate stokers; induced fan draught, at 25 lb. of coal (rough engine slack) per square foot of grate area. Evaporation per sq. ft. of heating surface, 5.25 lb. In-going gases to economiser, 450° Fah. Out-going gases from economiser, 300° Fah.

though it is quite possible to burn the same class of coal up to 30 lb. per square foot of grate area with good economy.

With regard to the rating of the water-tube boilers it is a matter of common knowledge that the rate of evaporation in the neighbourhood of the furnace is very high compared with other parts of the boiler. As the rate of combustion increases so does the rate of evaporation with the same size of boiler. The author has noticed that manufacturers have put forward for different capacities similar sizes of boiler, but with stokers having a larger grate area, so that some standard as to rating should be adopted. The standard adopted by the electric supply department at Sheffield is that the normal evaporation should be obtained by burning 25 lb. per square foot of grate area with a chain grate stoker burning engine slack.

The author has lately installed some 8 feet, Class E. underfeed stokers to two water-tube boilers fitted with both forced and induced draught. The boilers were specified to evaporate 35,000 lb. of steam each from and at 212° Fah. The combination is as follows:—

> Water-tube boilers; economisers; underfeed stokers; induced-draught fan, H.P. on load 55, giving 1.3 in. draught. Forced-draught fan H.P. on load 30, giving 2 in. draught. Normal coal per square foot of grate area, 33.5 lb. Evaporation per square foot of heating surface, 5.25. In-going gases to economiser, 518° Fah. Out-going gases from economiser, 290° Fah.

The results are: Burning up to 47 lb. of coal per square foot of grate area under the above working conditions the boiler evaporated 58,000 lb. of water per hour from and at 212° Fah. but the heat of the brickwork was so intense after the first hour's run that the rate of burning was reduced to 38 lb. per square foot of grate area.

The author thinks that this combination has a great future before it and its limit will be determined by the ability of the brickwork, etc., to withstand the intense heat generated in the furnace with the above conditions.

The author is a believer in mechanical induced draught, and strongly advocates that care should be exercised to install a fan or fans capable of dealing with the worst atmospheric conditions and of dealing with sufficient gases for the maximum possible overload of the plant.

The ideal stoker should be able to deal with clean nuts or smudge, should be able to get to full duty from banked fires in the shortest possible time, should be capable of doing 50 per cent. above its normal duty for short periods in case of emergency, should consume all combustible matter fed on to it with the most efficient percentage of CO_2, and should be smokeless under all conditions, besides which it must be strongly built, reliable, and easy of access for the repair of the working parts or the renewal of the bars. These conditions are, of course, difficult of attainment in one stoker. The chain grate has in the past done yeoman work, but it has its weak points. The underfeed stoker, which has recently been enlarged and strengthened in its mechanical parts, has proved itself, from the author's experience during the last eighteen months, most satisfactory, and complies more nearly with the conditions before-mentioned.

The author therefore considers that the safest arrangement for a large boiler-house is to install a certain proportion of the old reliable chain grate, which has proved satisfactory over a long series of years, and the remaining portion of the newer type, which, while being excellent from results obtained in a comparatively short time, has yet to prove its superiority over a longer period.

The boiler house foreman is responsible for the efficient working of the boilers, takes daily records of the coal consumption and water evaporation, temperature of flue gases and CO_2, records, and makes periodical tests on the boilers.

The boiler house repair foreman works in conjunction with the boiler house foreman, and is responsible for the quick repairs to the boilers, superheaters, stoker and economisers, feed pumps and other auxiliary plant. A chemist is now engaged to carry out all boiler house testing.

All coal delivered to the station is weighed on a weighbridge and either deposited in the coal shoots or bunkers, or sent to the coal storage ground. At the present time there are 3,000 tons immediately over the boilers and 5,000 tons on the coal storage ground. The author finds that rough slack obtained in the Yorkshire district and stored in large quantities is subject to spontaneous combustion. Consequently nothing but screened nuts are now being laid down and stored in 500 ton lots. The heaps are ventilated and temperatures are taken regularly. In this way, it is anticipated, the coal may be left in the open for a period of years, and the loss of calorific value will be only 10 to 15 per cent.

With regard to coal for storage, considerable capital expendi-

* A similar plant was described in the E.R., Nov. 3rd, 1911.

ture is entailed for handling. The capital expenditure works out at approximately 15s. per ton of coal stored to about six feet high. If, however, a better class of fuel be purchased and the height increased, the cost will be proportionately less. This 15s. includes the provision of a complete scheme for delivering the coal from the wagons on to the storage ground and back again into the coal bunkers over the boiler. Another system of storing coal where spare ground space is limited is to erect a silo and install the Clayton or some similar system for extinguishing fire. A silo can be built to contain two or three thousand tons of coal, and, after filling it, the entrance manholes must be made air-tight. Through the silo pass two main pipes from which branch pipes can be taken as required. These main pipes connect up to an installation consisting of a generator, cooler, blower and engine. The blower driven by the engine draws air from the silo along one of the main pipes into the generator, where the oxygen of the air combines with sulphur by combustion and forms a mixture of nitrogen and sulphur dioxide. The gas is drawn through the cooler into the blower, which then forces it along a main delivery pipe back into the same compartment from which the air is drawn by suction. The suction and delivery of gas proceed simultaneously and as the volume withdrawn is equal to that delivered there is no leakage beyond what is due to diffusion.

For the extinction of fire in the silo it is not sufficient merely to fill up the silo with inert gas; efficient means must be taken to get rid of the large amount of heat which the coal will hold. By this system, after the fire has been stopped by the introduction of gas, the generator is cut out of circuit and the gas-laden atmosphere circulated by means of the suction and delivery pipes through the cooler, until the temperature of the coal is brought down to normal. Fresh air is then admitted whilst this cooling process is continued, so that the gas is gradually dissipated and re-ignition prevented.

Experiments are also now being carried out to determine the effect of turning a portion of the flue gases into enclosed bunkers in which coal fires occur.

The coal is purchased to a rigid specification, and if the calorific value on delivery is below the specified amount a corresponding reduction is made in the price.

Frequent tests are made to ascertain the hardness of the water, and the degree of concentration in the boilers. No softening plant is required, as the supply for make-up contains only 3° of hardness.

Complete records are kept on a card system as to the cost of maintenance of each boiler complete with stoker, superheated, and economiser.

The following is a copy of the weekly costs sheet used in Sheffield, the figures being the actual figures obtained for the week named :—

In looking through his present load curves, the author arrives at a figure of 2,000 KW. of plant installed out of a total of 25,000 KW. It would appear, therefore, other things being found satisfactory, that it might be economical to provide by-product plant for about 8 per cent. of the total plant of a power-house, and this plant should be run at practically 80 per cent. load factor to make it a paying proposition.

A much larger area would be required, and this in many places would be difficult to find with the requisite facilities as regards water, coal, etc.

Finally, the author wishes to impress on all the great importance of a present-day boiler house and plant; it is, in fact, of paramount importance; a place where more money can be saved than anywhere else in a power station, by employing and paying highly-trained and capable men who can bring scientific knowledge to bear on the many important problems that present themselves for investigation.

DISCUSSION.

MR. W. W. LACKIE (Glasgow), who opened the discussion, said his American visit had convinced him of the necessity of designing a boiler house as a boiler house, not as a stokehold; he suggested ash basement, boilers and economisers on three floors. Nothing but steel should be used in steam pipe lines and he had found an automatic coal weigher to each boiler the most reliable arrangement. If possible, arrangements should be made for uniform coal deliveries over the year; otherwise it would be better to receive more in the summer. The use of indicating instruments in the boiler house and the institution of special tests had resulted in a saving of £10,000 in one year at Glasgow. He found the suction-ash plant very satisfactory for removing both ashes and soot; it required some 5 KW. hours per ton for operation. The use of conveyors for ash handling had been given up on account of the expense. His investigations showed that under certain conditions and with coal at less than 10/- per ton it might pay to use gas firing and recover by-products. As a result of his visit to the States he had equipped two boilers with the American "Taylor" stoker, which was specially designed for giving the excess steam required for meeting sudden loads. He was now equipping each boiler with a steam meter as he had found them satisfactory. The cost of banking boiler fires at Glasgow was some £5,000 per annum, and the cost of stacking coal was estimated at 7/6 per ton there.

MR. J. W. BEAUCHAMP (West Ham), said the cost of ash disposal by tipping on land bought for the purpose became less owing to the fixed charges being spread over a quantity. The West Ham suction-ash plant for 10,000 tons per year cost 7d.

CITY OF SHEFFIELD—ELECTRIC SUPPLY DEPARTMENT.

COMPARATIVE STATEMENT OF WORKS COSTS—Week ending April 30th, 1913.

Particulars.	Neepsend.		Sheaf Street.		Combined Stations.	
Units generated	532,500		33,170		565,670	
	Tons. Cwt. Qrs.					
Coal—Neepsend	634 — —					
Sheaf Street	77 5 3					
	711 5 3	£ 240 7 10	Cost per unit. ·11	£ 35 8 2	Cost per unit. ·28	£ 275 16 0	Cost per unit. ·12
Ashes		10 17 8		2 18 8		13 16 4	
	Gallons.						
Water—Neepsend	78,260						
Sheaf Street	120,700						
	198 960	2 2 6	·00	3 4 3	·02	5 6 9	·00
Oil, waste and stores		4 14 9	·00	4 0 10	·02	8 15 7	·01
Salaries and wages		76 15 7	·03	29 18 7	·22	106 14 2	·05
Engine-room equipment		—		1 8 8		1 8 8	
Boiler-house equipment		25 11 5		5 4 4		30 15 9	
Buildings		1 11 4	·04	—	·07	1 11 4	·04
Sundries		3 18 4		—		3 18 4	
Lighting and power		59 19 9		3 3 11		63 3 8	
Total works costs		425 19 2	·18	85 7 5	·61	511 6 7	·22
Maximum demand		8,331 KW.		1,611		9,942	
Load factor = units × 100 / max. load × 24 × 7		38·05		12·26		33·87	
Current used on works		23,527		807		24,334	

With regard to the suggestion made from time to time lately, that large electric power stations should be equipped with by-product plants, it will, of course, be necessary to bear in mind that if such plants were installed for distilling the coal and making gas either for burning under the boilers or for driving a gas engine, the capital expenditure per kilowatt of plant installed would have to be considerably higher than it is at present, in an ordinary coal-fired steam turbine station. In view of this larger capital expenditure, it will be necessary carefully to arrive at the percentage of the total plant, which could be economically operated by means of the fuel obtained by this by-product plant.

in fixed charges and 2d. in electrical energy per ton; it appeared to be the most practical method of dealing with ashes. He used the Roots blower pattern and had no trouble with erosion. Trouble was experienced with dust where the air was blown out and this could be avoided by using a separator or filter. The ash tunnel itself was much cleaner than under the old conditions. The ashes were really carried by a current of air and he understood that the makers were now devising a means of using the air in a closed circuit which would get over the discharge trouble. He thought the placing of economisers above the boilers might lead to trouble if leaks occurred. Opinion was divided as to whether it was better to seal or

ventilate coal heaps. The logical system of ventilating a boiler house was to draw in the warm air from the engine room. He thought the construction of a special pipe bay between the engine and boiler houses was worth considering as this would isolate trouble and provide some air insulation if closed.

MR. C. H. WORDINGHAM said he was surprised that more use was not made of the tippler for emptying trucks, as this got over the difficulty of the special coal trucks. He asked why both steam and electric feed pumps were used by the author? His dream was that gas-firing would eventually be brought about through a community of interests between the gas and electric suppliers, so that the two would be merged into one. The position might be much influenced by surface combustion and its higher efficiency, which would make possible smaller boilers and boiler houses more nearly proportionate to turbine houses.

MR. W. C. P. TAPPER (Stepney), remarked on the author's favourable situation in regard to ash disposal; in Stepney there were 300,000 people in 2 sq. miles and no space was available for ash tips. He found it quite possible to arrange boilers parallel to the engine house, using 5,000 KW. turbine units. At Stepney there were four chimneys on the Prat system, to eight boilers, using the cold blast system and giving satisfactory results. He was now adopting for new boilers the later "in-circuit" system, with forced draught below the grate and induced draught above, a balanced system, in single boiler units. Reference had been made to gas-firing and by-product recovery; he thought electrical engineers were not the proper people to take up gas production. This afforded an excellent opportunity of working in with the gas people who were specialists in that line, and it would do away with the coal and ash handling problem and might pay.

MR. YORATH LEWIS referred to the Niclausse boiler plant at Southend-on-Sea, which by giving a very high steaming capacity per unit area, greatly helped to solve the difficulties of design introduced by the turbine; boiler and other trusts were responsible for the stereotyped designs of present day stations.

MR. A. E. SEATON pointed out that the sequel to the very fine steam consumptions offered by some turbine makers was found in the trouble which arose in the boiler house.

MR. BAILEY (Birmingham), urged the superiority of steam-driven auxiliaries, which were easier to start up after an interruption in supply, than motor-driven ones. Small steam plant was also more reliable than motors. He did not think the author's data as to boiler performance was consistent with practical working conditions. Between 3 and 4 per cent. of the coal passing over the grate fell through as riddlings and the usual practice of throwing these into the stoker hopper was unsatisfactory. At Summer Lane they fired two boilers entirely with riddlings. They carried a stock of 10,000 tons of coal at Birmingham; this was stacked 12 feet deep, the coal being graded to allow heat to escape if generated. One stack was 3 years old and another, containing 700 tons had been in place 6 years. The only deterioration in calorific value was on the surface; the stack was found to be free from sulphur which was a point of importance.

MR. BRYDGES (Eastbourne), suggested that it was better to carry pump exhausts through the hot-well and economiser to the boiler; this arrangement would do away with eight steam-feed heaters employed by the author. Preheating of the air supplied to the furnace appeared to be a desirable feature; its disadvantage was the burning of the firebars. He had found it impossible to store Derbyshire slack more than 8 feet deep, but with a pea coal, containing sulphur, he stacked 18 feet deep and found the temperature rose some 10 deg., remaining stationary at that. In practice the horizontal tube boiler did not give so high an evaporation as the vertical tube boiler, and the cleaning was a much more serious matter, occupying twice as much time.

MR. F. AYTON (Ipswich), suggested that forcing competition with the gas interests might facilitate the obtaining of reasonable offers in regard to gas firing. From observations made, he found that he obtained greatly improved boiler results when the wind was blowing into the big doors of the boiler house; he used Notts. slack, stacked 12 ft. deep, and had no trouble as regards heating. The flues at the Ipswich station were designed on a liberal scale having regard to the growth of the plant and in the initial stages this gave proportionately excessive radiating and leaking surfaces; he thought that as an alternative such flues could be subdivided in stories. In Ipswich a bonus was offered to all employes concerned for the reduction of coal consumed; he commented on the impossibility of comparing the records of coal consumption of the different undertakings with the usual data given.

MR. ROBT. HAMMOND felt that until the Electric Lighting Act was amended, to compel returns of calorific value, the previous speaker would have to be satisfied with the present state of affairs. He complimented the author on the use he had made of the Neepsend site and mentioned that while in South Africa, he had found the Vereeniging plant, which employed the Prat induced draught system, operating almost smokelessly on full load. Another speaker also dealt with the Prat system, pointing out that the "in-circuit" arrangement was at least 25 per cent. more efficient than the out-circuit type using cold air injection, and that the draught power quoted by the author was much in excess of that required with the Prat arrangement.

DR. FERRANTI said it was theoretically correct to heat air for combustion, but in practice it was not a satisfactory method. The apparatus was simple and not at all efficient; it was generally too small. He knew a number of cases of factories where it had proved unsatisfactory and where a moderately efficient system was in use trouble arose with the firebars which depended on incoming air for cooling them. As regarded the use of gas for firing, &c., if by-product recovery on a paying scale and gas-firing were to be adopted for electrical generating plants, the gas-making processes in use would have to be revolutionised. He saw no prospect of bringing gas and electrical people together in this matter, owing to the great difference in essentials in the processes involved.

MR. SELVEY pointed out as regards the Neepsend site, that many modern stations were obtaining similar arrangements for filling the bunkers, but by artificial means. He was much struck with the real commercial idea permeating municipal men at the present day. No one had referred to the point of view of the buyer of coal for the boilers; so far as he knew no one had attempted to apply the practical experience of the metallurgist to the purchase of coal and there was no sampler available on the results of which a purchase could be carried out. With large turbine units, the boilers largely depended on the firing equipment and our modern machine stoker was not on a par with the rest of the equipment, which explained the introduction of the Taylor stoker from America. To introduce gas-making as suggested would mean adding another link in the chain of generating electricity, and the gas people already had trouble in getting rid of their gas coke.

This concluded the discussion to which Mr. Fedden will communicate his reply.

Design and Operation of Modern Boiler House Plant.

THIS paper, read before the I.M.E.A. by Mr. Fedden is not quite so general as its title, but is more a description of the works at Neepsend, Sheffield, which were described in our issue of August 30th, 1912, p. 324. It is, nevertheless, interesting as touching upon points which are too often neglected.

The author, for example, gives as the main points to be considered in selecting a site :—(1) An adequate supply of water for condensing ; (2) Facilities for dealing with ashes ; (3) Accommodation for getting in and storing coal.

The author, however, excludes (1) as beyond the province of this paper, but it may be pointed out that power station designers have not always troubled themselves about condensing, but have regarded it as cheaper to omit this economy. To follow this policy nowadays would, of course, be impossible ; on the contrary, the provision of an ample supply of water for condensing must be regarded as a crucial test of the suitability of a site for a large power station. The author had a lesson in site selection, and it appears that he is overlooking an economy on lines somewhat similar to those he followed in fitting a low site for this purpose. The site was full of stuff which had to be cut down as much as 60 ft. Trial holes showed that the stuff was suitable for brickmaking, and so three kilns were built to supply bricks to build a large permanent kiln and chimney, and the power station was built out of the bricks thus made, thus making the site a cheap one, and bringing it down to a low level, so that railway trucks are run over the coal bunkers. The capital cost of the first section of the station, including land and sidings, was under £10 per KW.

With this object lesson before him, it seems as though the author has gone aside somewhat in leasing a valley and building a 200 yards ropeway equal to dealing with 20 tons of ashes per hour, though we are not told why this figure should be so large even for a dirty coal of 15 per cent. ash, when the total evaporation is only 250,000 lb. per hour, as stated. The author's opinion as to the normal rating of a boiler is that it should be that evaporation which pertains to a coal consumption of 25 lb. per sq. foot per hour (the paper reads 251 lb.—an obvious misprint). But at page 3 the normal rating for three types or sizes of boiler of 80, 144 and 192 sq. ft. grate area is given as 30,000, 35,000, and 48,000 lb. The station is at present occupied to the extent of about five-eighths of its boiler capacity. But to return to the ashes ; the coal consumption being perhaps 12 tons per hour at most can scarcely occupy such a big ash conveyor. But it is not that with which we would quarrel so much as that in a town like Sheffield there should not be some attempt to crush the ash and clinker and make con-

crete goods of it, thus saving the 1s. 3d. per ton of disposal costs, not to mention the destruction of a valley which appears at least to possess some amenities of vegetation.

The feed apparatus and pipes call for no special comment, unless it is that the provision of rollers to carry pipes is hardly necessary, but that simple rubbing pieces clamped to the pipes or riveted should be sufficient. Rollers are apt to be clogged by dirt, and to become the worst of rubbing surfaces. But an initially-provided rubbing plate acts as a brake against pipe vibration.

Each boiler is fed from a shoot of 100 tons, which feeds the stoker hopper, and there are grids to stop all large lumps in the coal which is tipped directly from the railway trucks. These trucks are of the bottom-emptying type, and only require the corners trimming out. There are five lines of rails over the bunkers, and the trucks are transferred by a traverser from one line to another. The shoots have measuring chambers and indicators to measure off the coal to the hoppers.

In a town like Sheffield, with a water supply of only 3° hardness, it is useless to discuss many questions, such as the class of boiler and water treatment. The only treatment of such a water, if oil free, is to heat it above 100° F. before it goes to the economiser. As to heating with live steam for the sake of economy, the author will have none of it. The actual facts are difficult to obtain, but he is up against so careful an authority as Normand.

A word of warning is given on the subject of ash removal from below the boilers, in that whatever the means employed, there should be openings in the boiler house floor as emergency ways by which the ashes may be removed for cartage, if the provided mechanism fails.

The ropeway to the tipping ground is arranged to swivel, and thus to shift its terminal as the ground becomes filled. The arc of the fan has a length of 190 ft. Locked coil steel carrier ropes are employed.

The question of boilers has settled itself almost entirely on the lines of grate area. It is not very practicable to supply huge turbines from shell boilers, because the grate area of the shell boiler is limited by the diameter of the furnace tubes. To get any serious grate breadth, a shell boiler must carry three furnace tubes, and must have a complicated stoker mechanism. Only by means of three furnace tubes can a shell boiler get a grate width of more than the boiler diameter, and then there is the disadvantage that the grates are not all on the same level. The need for wide grates implies very large boilers. At sea the shell boiler holds its own, but the need for reliability at sea is perhaps greater than in an electric station.

Whether a water-tube boiler should have tubes more nearly vertical on more nearly horizontal, does not seem to be of much matter with water of only three degrees of hardness. Nor is the question of heavy forcing so serious. The quality of the water rules the rate of combustion, and, incidentally, as the author sees, the relative proportions, of the economiser, superheater and accessories.

The author's provision of 25 lb. of slack per sq. ft. of grate is essentially moderate if the ash content of the coal is so much as 15 per cent. But his figure for evaporation, namely, 5·25 lb. per sq. ft. of heating surface seems to be based on Sheffield water, and again the temperature of 450° at the ingoing of the economiser seems low.

No particulars are given of the economiser in the combination on page 15 of the paper, but 290° for the outgoing of the economiser seems too low a temperature.

In this combination the combustion was tried as high as 47 lb. per foot, but the furnace brickwork became too hot—the draught was by fan—and it had to be moderated to 38 lb. The output was too much for the superheater, and the superheat fell from 150° to 110° F. Undoubtedly with boilers fed with suitable water, the limit is apt to be found in the ability of the brickwork to bear the high temperature of forced combustion. Such outputs as indicated by the writer cannot be got with natural draught, and only the best brickwork can stand the temperature. Brick arches are essential for bituminous coal, and the future must wait on improved brick material. It is perhaps allowable to question the real commercial value of all this hustle. It is wise to have a fan draught to enable bad atmospheric conditions to be dealt with, but is it wise to increase wear and tear so far that it does not really pay commercially?

No large power station would now dispense with mechanical stoking. These machines are far from perfect, but are constantly becoming better as the result of experience. The author notes some of these faults without suggesting remedies. Few stokers are smokeless under all conditions, but very little smoke is now made by them where other essentials are present. As regards grates burning bare, this can be more or less guarded against by suitable under-baffles.

In storing coal, the Yorkshire slack is found very liable to heating. This is quite likely, for slack, if run-of-mine to some extent, is particularly liable to overheat, and it need be no matter for surprise that only screened nuts are now stored, and, in lots of 500 tons, ventilated and regularly tested for temperatures.

The author says that coal may be left in the open for a period of years—whatever this may mean—and lose only 10 to 15 per cent. of of its calorific value. The tests published by the American Coal Testing Department of the Geological Survey seem to indicate losses much less than this. This department found that run-of-mine coal was the most liable to heat, and that storage should not exceed 12 ft. in depth, and that the base of a coal pile should not consist of open floors such as clinker, or of large coal lumps which served to let in air.

To fit out Neepsend station to store coal in banks 6 ft. deep, has involved an expenditure of 15s. per ton stored.

If a silo can be afforded in which to store coal, there seems no reason to question that the cooled furnace gases might be blown into the middle of the mass of coal until the silo was charged with gas, chiefly inert, and so surrounded, there could be no spontaneous heating in a closed silo.

The author says that some experiment of this order is in progress. The outcome will be watched for with interest. Of the total working cost of the station, viz., £425 per week, coals stands for £240 and wages for £77 nearly.

The expenditure of £60 on lighting and power, without any wages, seems extravagant. The current used in the works amounts to nearly 4½ per cent. of the whole. The cost per unit comes out at 0·18d.

Apparently it would save £60 per week if the smaller Sheaf Street works could be closed, for there current costs 0·61d. per unit to produce on a load factor of 12·26 only. Now £60 per week represents good interest on a very considerable plant at £10 per KW.

The author touches on the question of by-product plants, and also on high superheat, and refers to a time when dull red gas (steam) will be passing through steam pipes and valves. On this point let it be remembered that economy is a good thing to aim at, and so is superheat. We do not know that there is any scientific reason which divides the working ability of iron at a line below red, and the new tool steels which cut and are yet red, do somewhat upset our instinctive objection to red-hot engine valves. Perhaps we are old fashioned in hoping that we shall never have to do with power station work that employs red-hot steam. True, the gas engine employs a white hot gas, but it does so in a water-jacketed cylinder, and it would hardly consist with reason to use red-hot steam in a water-jacketed cylinder. Excessive superheat means risk and loss without commensurate gain.

Any description of a big electricity works has its lesson, and is so far valuable, and, as stated at the outset, this paper is more of a single works paper than a general thesis on power station design. It lacks simply the article *a* before the word "modern" of its title.—B.

The Tramways and Light Railways Congress.—The annual Congress of the Tramways and Light Railways Association will be held at Newcastle-on-Tyne, on July 16th and 17th. The programme includes papers on the following:—"Some Features of Newcastle Corporation Tramways," by Councillor R. Mayne, J.P., vice-chairman, Newcastle Corporation Tramways Committee; "Tramway Experiences in Brazil," by Mr. H. M. Sayers, M.I.E.E.; "Standard Tram Rails: a Comparison of English and Foreign Sections," by Fred Bland, M.I.Mech.E. (Member of the Council); "Rail-Joints: their Construction and Maintenance," by Mr. R. Humphries, tramways engineer, Birmingham and Midland Tramways Joint Committee; "Town Planning," by Mr. J. A. Brodie, city engineer, Liverpool Corporation.

NEW PATENTS APPLIED FOR, 1914.

(NOT YET PUBLISHED).

Compiled expressly for this journal by MESSRS. W. P. THOMPSON & Co., Electrical Patent Agents, 285, High Holborn, London, W.C., and at Liverpool and Bradford, to whom all inquiries should be addressed.

13,787. "Transformers." J. E. STATTER. June 8th.

13,800. "Securing devices for electric-lamp shades and the like." F. D. PHILLIPPS. June 8th.

13,823. "Electrical switch." A. ARENSBERG. June 8th.

13,854. "Means for telephonic communication between moving trains and railway stations or other stationary places." T. G. THORNBLAD, K. H. WARFVINGE, and V. G. WERNER. June 8th. (Convention date, June 10th, 1913, Sweden). (Complete).

13,883. "Railway safe-running devices." A. R. ANGUS. June 8th. (Divided Application on 9,090/13. April 17th. Convention date, February 13th, 1913, Australia). (Complete).

13,884. "Railway safe-running devices." A. R. ANGUS. June 8th. (Divided Application on 9,090/13. April 17th. Convention date, February 13th, 1913, Australia). (Complete).

13,920. "Search-lights or projectors." SIEMENS-SCHUCKERTWERKE G.M.B.H. June 9th. (Convention date, June 21st, 1913, Germany). (Complete).

13,933. "Electric cables." E. G. WATERS and CALLENDER'S CABLE & CONSTRUCTION CO., LTD. June 9th.

13,945. "Electric railways and electric connections thereon." F. DE PALMA. June 9th. (Complete).

13,951. "Electric furnaces for metallurgical purposes." H. NATHUSIUS and WESTDEUTSCHE THOMASPHOSPHAT-WERKE G.M.B.H. June 9th. (Complete).

13,960. "Electric wire connection." M. E. HOLDAWAY, and B. J. ANDERSON. June 9th. (Complete).

13,961. "Signalling on railways by detonators." COMPAGNIE DE SIGNAUX ELECTRIQUES POUR CHEMINS DE FER. June 9th. (Convention date, June 27th, 1913, France). (Complete).

13,966. "Multiple-hearth electric furnace with electrodes of different polarity arranged above the smelting hearths." A. HELFENSTEIN. June 9th. (Complete.)

13,973. "Mercury vapor rectifiers." G. W. HEIMROD. June 9th. (Convention date, June 11th, 1913, Germany). (Complete).

13,976. "Electrical switch gear or devices for automatically closing or breaking circuits." E. V. GRATZE. June 10th.

14,006. "Construction of contact apparatus for closing electrical circuits." J. E. COLAS. June 10th. (Addition to 26,268/13. Convention date, June 20th, 1913, Belgium). (Complete).

14,021. "Electrically-driven machine tools." SIEMENS-SCHUCKERTWERKE G.M.B.H. June 10th. (Convention date, June 13th, 1913, Switzerland.) (Complete.)

14,022. "Cooling electric hand drilling-machines." SIEMENS-SCHUCKERTWERKE G.M.B.H. June 10th. (Convention date, June 19th, 1913, Switzerland). (Complete).

14,030. "Electric transformers." F. E. BERRY. June 10th.

14,043. "Armatures of dynamo-electrical machines and the like." W. H. SCOTT. June 10th.

14,044. "Method of insulating coils of flat conductors for electric machines." ALLGEMEINE ELEKTRICITATS GES. June 10th. (Convention date, June 10th, 1913, Germany). (Complete).

14,049. "Means of transporting bodies or masses by electro-magnetic means." E. V. GRATZE. June 10th.

14,060. "Portable electric lamps." M. H. GOLDSTONE. June 11th.

14,081. "Electrically-operated cranes, elevators, colliery winding-gear, crane-luffing devices, and the like." G. NEALE, and C. H. NICHOLSON. June 11th.

14,094. "Electric safety lamps or the like and apparatus in connection therewith." E. A. HAILWOOD. June 11th. (Addition to 436/11. Divided Application on 18,694/13. August 18th).

14,095. "Safety lamps or the like apparatus in connection therewith." E. A. HAILWOOD. June 11th. (Addition to 28,255/07. Divided Application on 18,694/13. August 18th).

14,098. "Current collectors for electric tramways." COMPAGNIE GENERALE DES OMNIBUS DE PARIS. June 11th. (Convention date, June 13th, 1913, France). (Complete).

14,102. "Control, of dynamo-electric machines for use alternatively for generating electric current or to act as motors for starting internal-combustion engines." CARLEON ELECTRICAL CO., LTD., and G. INRIG. June 11th.

14,103. "Apparatus for electrically lighting vehicles." CARLEON ELECTRICAL CO., LTD., and G. INRIG. June 11th.

14,119. "Electric accumulators." A. DININ. June 11th. (Complete).

14,125. "Electrical apparatus for transmitting and receiving signals." SIR A. T. DAWSON, and G. T. BUCKHAM. June 11th.

14,146. "Electric switching devices." F. N. PICKETT. June 12th.

14,156. "Sparking plugs for internal-combustion engines." W. V. WILLIAMS. June 12th.

14,159. "Electric fuses." A. H. RAILING and C. C. GARRARD. June 12th.

14,162. "Electrical heater and support for wires thereof." G. COOPER.

14,186. "Appliances for maintaining electric conductivity in conduit systems for carrying cables for power, light, or other electrical installations." F. J. B. WINEBERG and C. T. PARKER.

14,189. "Railway safe-running devices." A. R. ANGUS. June 13th. (Divided Application on 9,090/13. April 17th. Convention date, February 13th, 1913, Australia). (Complete).

14,192. "Process and electric furnace permitting the extraction in a state of purity of zinc from its ores." E. F. COTE and P. R. PIERRON. June 12th. (Convention date, November 19th, 1913, France). (Complete).

14,224. "Electric igniters." V. F. FEENY. June 12th. (Fabrik Elektrischer Zünder G.m.b.H., Germany). (Complete).

14,229. "Methods of manufacturing metallic bodies." BRITISH THOMSON-HOUSTON CO., LTD. June 12th. (General Electric Co., United States).

14,268. "Radio-active apparatus." PIERRE GERMAIN. June 13th. (Convention date, July 5th, 1913, France). (Complete).

14,276. "Telegraphic code apparatus." P. BIENVAUX. June 13th. (Convention date, June 13th, 1913, Germany). (Complete).

14,278. "Rotors for dynamo electric machinery." SIEMENS BROS. DYNAMO WORKS, LTD., and E. O. KIEFFER. June 13th.

14,294. "Electric controllers." A. WEST. June 13th.

PUBLISHED SPECIFICATIONS.

Copies of any of the Specifications in the following list may be obtained of MESSRS. W. P. THOMPSON & Co., 285, High Holborn, W.C., and at Liverpool and Bradford; price, post free, 9d. (in stamps).

1913.

7,232. IGNITION AND STARTING SYSTEMS FOR INTERNAL-COMBUSTION ENGINES. L. Langner. March 26th.

11,993. ELECTRIC HEATERS. J. Mann. May 22nd.

12,035. TELEPHONE SYSTEMS. Automatic Telephone Manufacturing Co. (Automatic Electric Co.). May 23rd. (Addition to 13,970/12).

12,054. INCANDESCENT ELECTRIC LAMPS. C. A. Harrison. May 23rd.

12,082. ARC LAMPS. H. Ayrton. May 23rd.

12,100. ELECTRICAL SELECTORS AND THE LIKE. T. G. Hodgkinson. May 23rd.

12,115. FITTINGS FOR METALLIC CONDUIT SYSTEMS FOR HOUSING ELECTRICAL CONDUCTORS, SPECIALLY APPLICABLE TO CEILING ROSE FITTINGS AND THE LIKE. Simplex Conduits, Ltd., and L. M. Waterhouse. May 24th.

12,162. TELEPHONE SYSTEMS. Automatic Telephone Manufacturing Co. (Automatic Electric Co.). May 24th.

12,256. PROCESS OF AND MEANS FOR REGULATING THE VACUUM IN X-RAY TUBES. H. C. Snook. May 26th. (June 18th, 1912).

12,266. SUBAQUEOUS AUDIBLE SIGNALLING APPARATUS. S. M. Davison. May 26th.

12,334. MOVING PICTURE TARGET APPARATUS. W. A. Bennett. May 27th.

12,663. FLUID FLOW METERS. British Thomson-Houston Co. (General Electric Co.). May 30th.

12,821. TELEPHONES, PHONOGRAPHS, AND LIKE SOUND-RECEIVING APPARATUS. J. F. Glover. June 2nd.

13,369. MECHANICAL ADVERTISING MACHINE. J. Bennett. August 13th.

13,602. MANUFACTURE OF ELECTRIC CABLES. C. J. Beaver and E. A. Claremont. June 12th.

14,027. ELECTRIC STRIKING AND DAMPING MECHANISM FOR BALLS, BARS, TUBES AND PLATES. T. L. Southgate. June 17th.

14,790. ELECTRIC MOTOR CONTROL SYSTEMS. British Thomson-Houston Co. (General Electric Co.). June 26th.

14,848. JUNCTION BOXES FOR ELECTRIC CIRCUITS. H. E. Walker. June 27th.

15,014. ELECTRICAL HEATING UNITS AND RESISTANCE COILS AND METHOD OF MANUFACTURING THE SAME. L. W. Campbell. June 30th. (November 13th, 1912).

16,853. STEREOSCOPIC X-RAY SYSTEMS. H. C. Snook and E. W. Kelly. July 22nd. (August 15th, 1912).

17,275. ELECTRICAL SWITCHES. W. J. Fahn, and J. C. Hutton. July 28th.

17,345. ELECTRIC CUT-OUTS. T. E. Murray, Junr. July 28th. (February 4th, 1913).

17,439. PRINTING TELEGRAPH APPARATUS. A. D. Cardwell. July 29th.

18,018. TELEPHONE TRANSMISSION SYSTEMS. Western Electric Co. (Woodward, acting for Western Electric Co.). August 7th.

18,409. ADVERTISING APPARATUS. R. Blakeney. August 13th.

20,181. TUBE LAMPS. A. Pilz. September 6th.

20,730. SELF-STARTERS FOR AUTOMOBILES. P. C. Campbell. September 13th. (April 3rd, 1913).

24,686. HEADSTOCKS OF ELECTRICALLY-DRIVEN LATHES AND OTHER MACHINE TOOLS. H. Kienzle. October 30th. (Divided Application on 12,235/13. May 26th).

25,236. THERMAL ELECTRIC CURRENT-LIMITING APPARATUS. T. De Olazabal Y. Eulate. November 5th. (January 25th, 1913).

26,949. CINEMATOGRAPH TARGET APPARATUS. Life Targets, Ltd., A. W. Harris, and D. H. Corbin. May 28th. (Divided Application on 12,411/13. May 28th).

26,950. CINEMATOGRAPH TARGET APPARATUS. Life Targets, Ltd., A. W. Harris, and D. H. Corbin. May 28th. (Divided Application on 12,411/13. May 28th).

27,474. TRAIN DISPATCHING AND SIGNALLING SYSTEMS. P. J. Simmen. November 28th.

28,334. MECHANISM FOR PRODUCING A STEP BY STEP MOTION BY ELECTRICAL MEANS. Evershed & Vignoles, Ltd., and J. C. Needham. December 8th.

28,894. VACUUM LIGHTNING-ARRESTORS. Western Electric Co. (Woodward, acting for Western Electric Co.). December 15th.

1914.

2,092. ARRANGEMENTS FOR TRANSMITTING AND RECEIVING SIGNALS. Siemens Bros. & Co. (Siemens & Halske Akt. Ges). January 26th. (Addition to 17,124/13).

3,832. BRUSH-HOLDER AND PLUG-CONTACT FOR USE WITH MAGNETO-ELECTRIC IGNITION APPARATUS. Unterberg & Helmle (Firm of). February 13th. (December 4th, 1913).

4,215. CONSTRUCTION AND OPERATION OF ELECTRICAL CONDENSERS OF THE RING TYPE. Hartman & Braun Akt. Ges. February 18th. (February 20th, 1913).

4,308 CONTROLLING OF ELECTRIC MOTORS FOR SHIP-PROPULSION AND MEANS THEREFOR. Siemens-Schuckertwerke Ges & F. Hulss. February 19th. (Divided Application on 13,148/13. June 6th).

4,397. HYGIENIC ATTACHMENTS FOR MOUTH-PIECES OF TELEPHONES, SPEAKING-TUBES AND THE LIKE. W. C. Hickmutt. February 20th.

8,565. ALTERNATING ELECTRIC CURRENT MACHINES HAVING BAR-WINDING. Allmanna Svenska Elektricka Aktiebolaget. April 4th. (April 11th, 1913).

7,562. ELECTRIC SWITCH. G. Von Hutschler & A. Ordon. March 25th.

9,235. STARTING AND SYNCHRONISING OF ROTARY CONVERTERS. Siemens Schuckertwerke Ges. April 14th. (April 14th, 1913).

Napier Tercentenary Celebration.—On July 24th to 27th there will be held a celebration, under the auspices of the Royal Society of Edinburgh, of the tercentenary of the publication of Napier's "Mirifici Logarithmorum Canonis Descriptio," the work which embodies the discovery of logarithms. The Right Hon. Lord Moulton, LL.D., F.R.S., will deliver the presidential address on July 24th, and many distinguished mathematicians, astronomers, actuaries and engineers will make communications on July 25th and 27th. An exhibition of calculating machines, apparatus and books, and of objects associated with Napier and the history of mathematics, will be held in connection with the celebration, and social entertainments will be organised.

Immediately following the Napier celebration a mathematical colloquium will be held on July 28th to 31st, under the auspices of the Edinburgh Mathematical Society, in the course of which will be delivered, amongst others, four lectures on "Critical Studies of Modern Electric Theories," by E. Cunningham, M.A. Those who desire to become members are requested to communicate, as soon as possible, with Mr. P. Comrie, 19, Craighouse Terrace, Edinburgh.

Patent Restorations.—Orders have been made restoring the following patents:—

C. W. Higgs. "Improvements in and relating to the transmission gear of motor vehicles." No. 18,707 of 1909.

W. Alexander. "Improvements in and relating to rotary pumps, compressors, engines and the like." No. 14,702 of 1909.

Applications for restoration have been made as follows:—

H. Zalomo. "Improved Speed Reducing or Multiplying Gear." No. 25,210 of 1908.

W. G. Cordingley. "Improvements in Calculating Machines." No. 1,751 of 1909.

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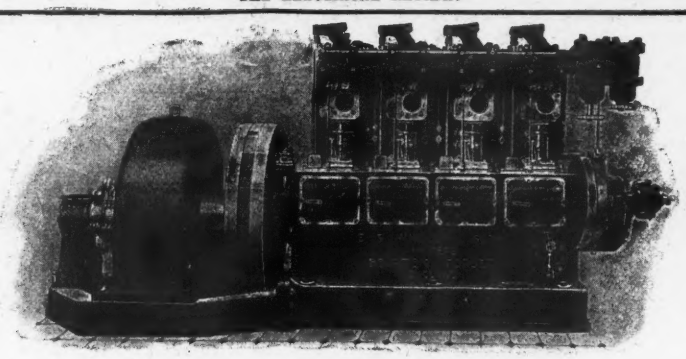

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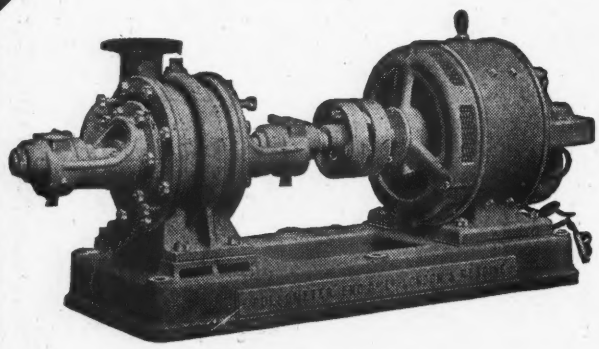

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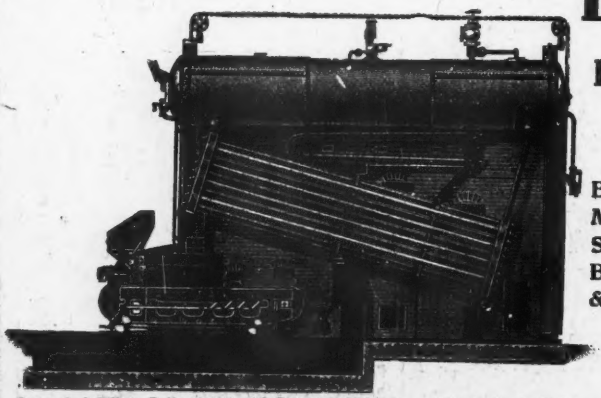

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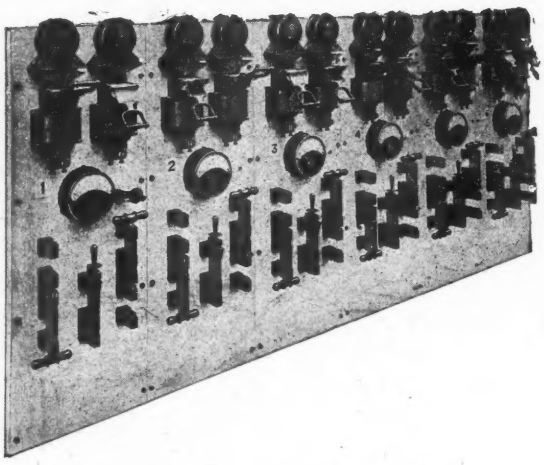

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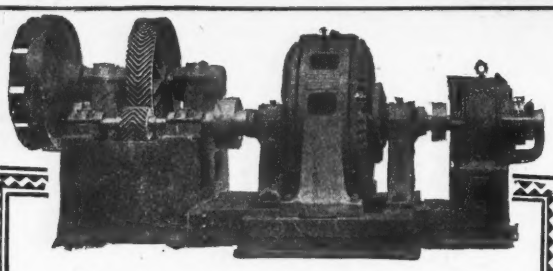

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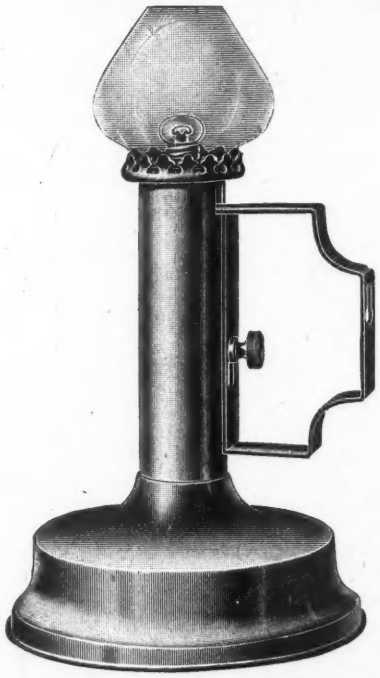

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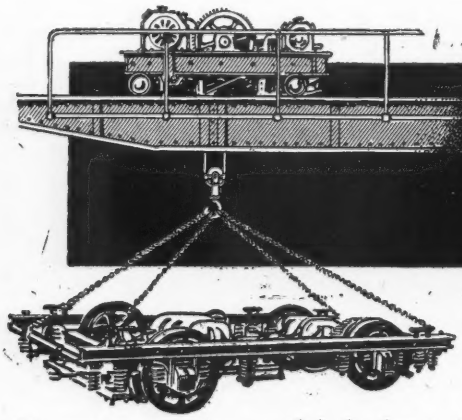

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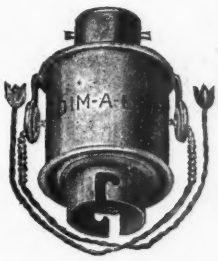

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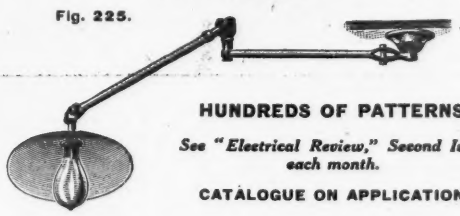

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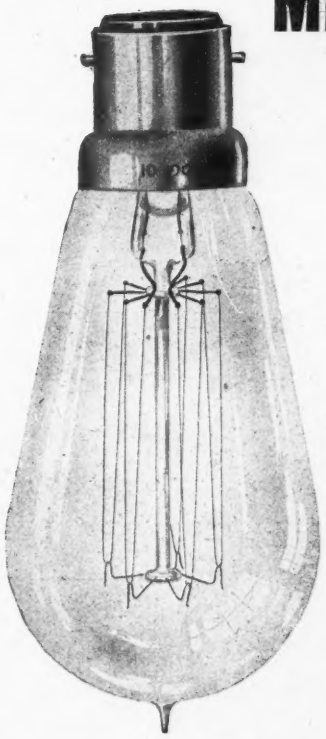

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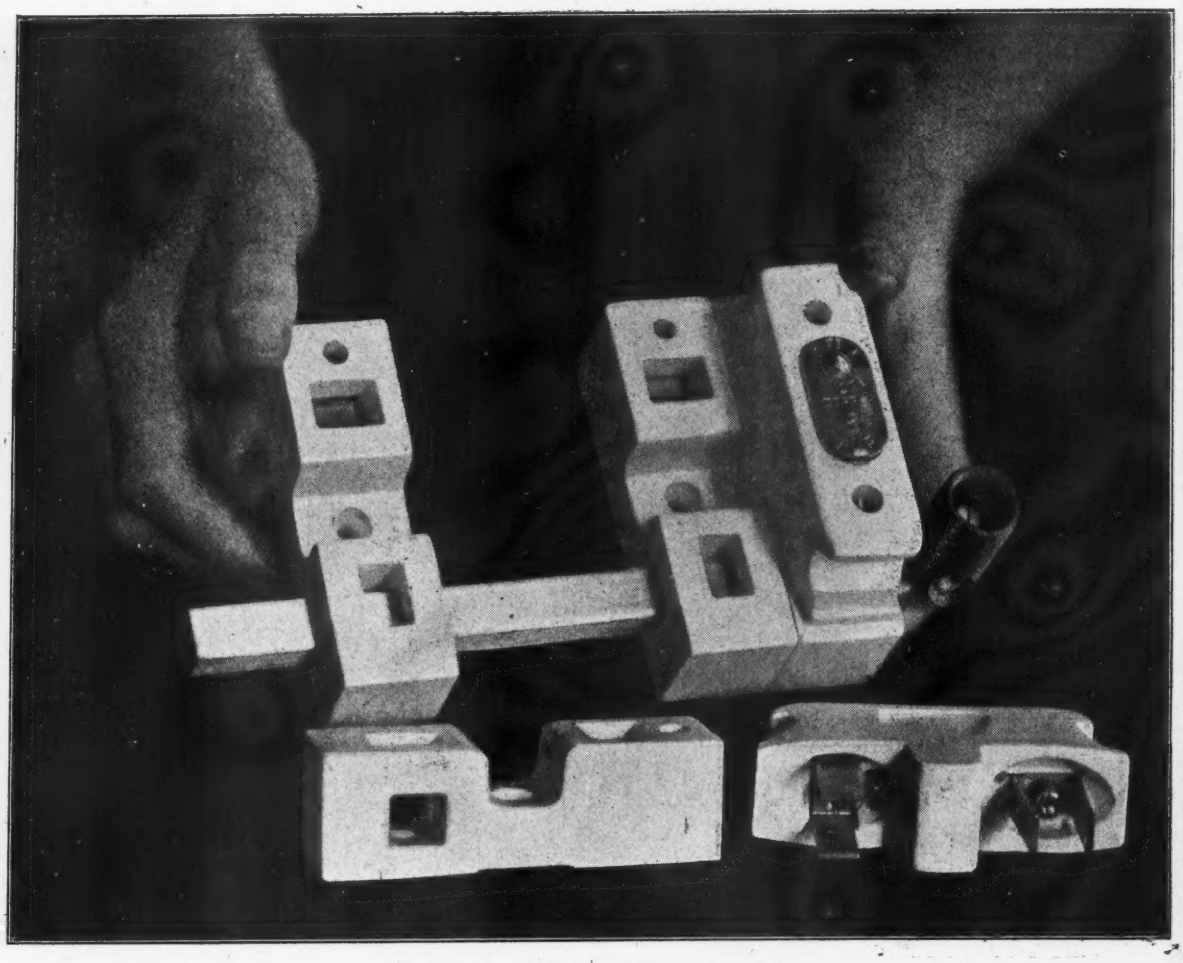

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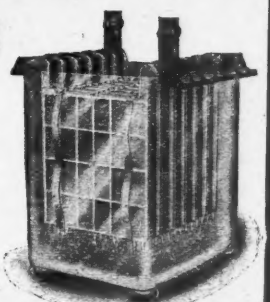

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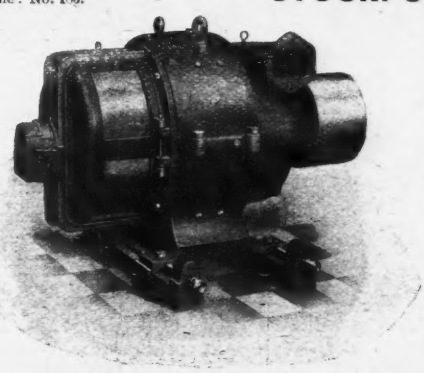

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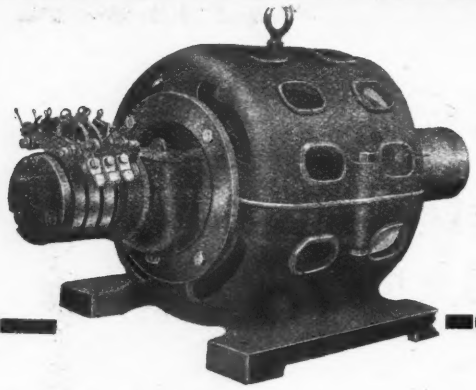

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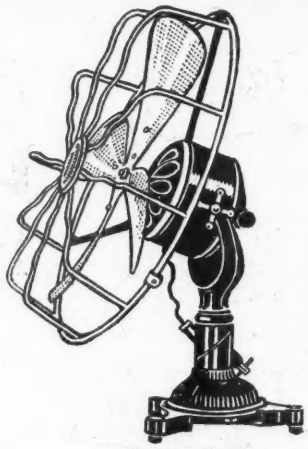

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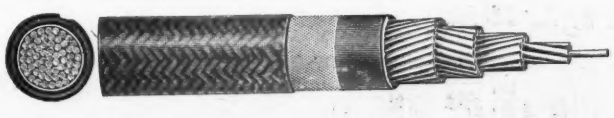

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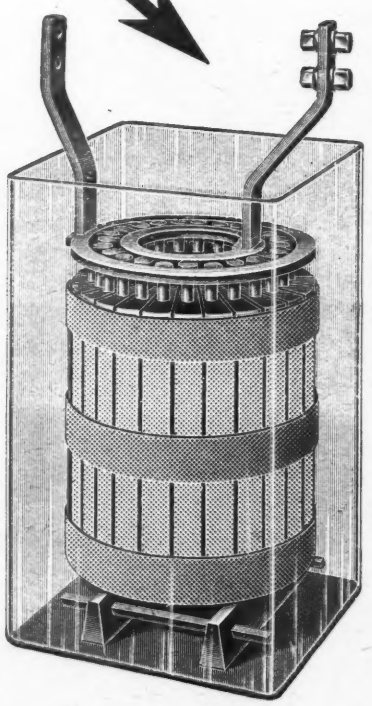

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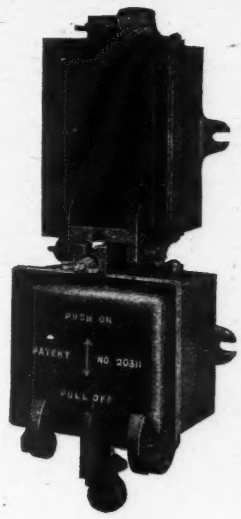

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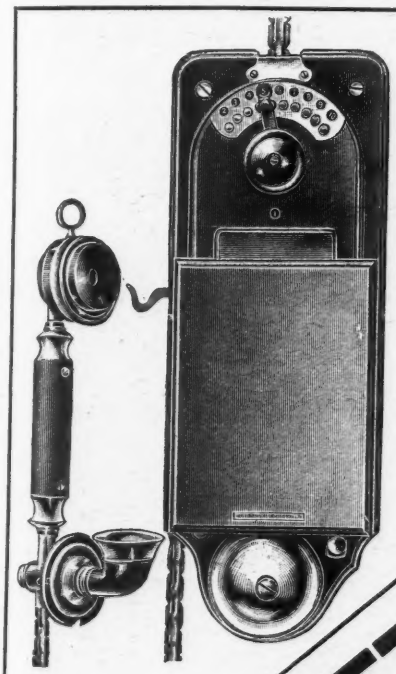

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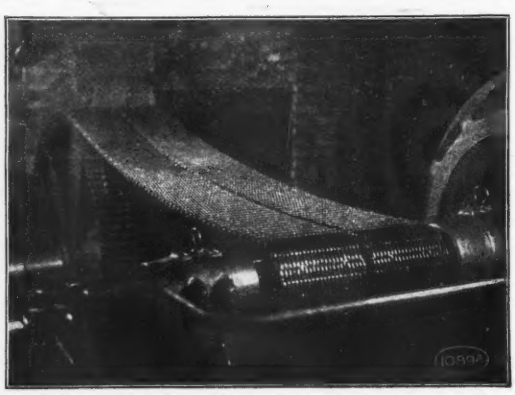

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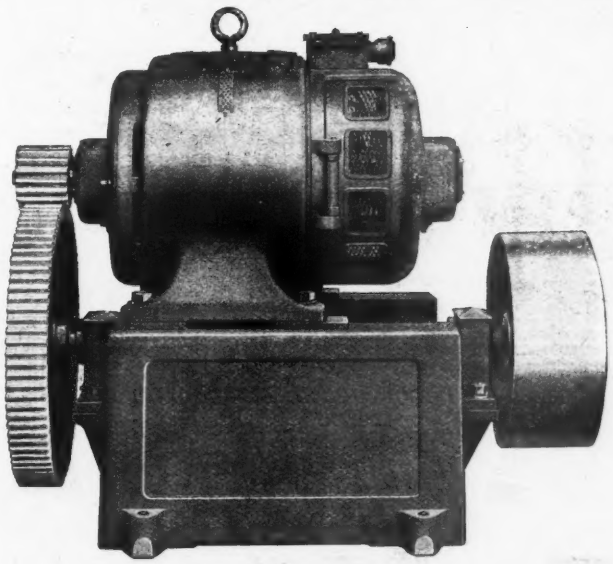

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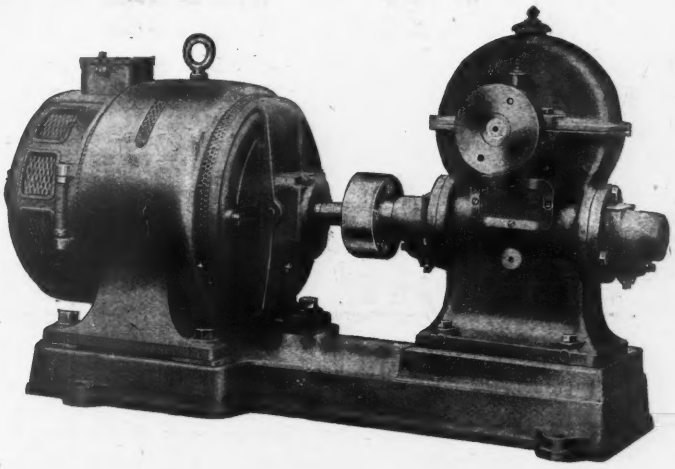

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Limited,

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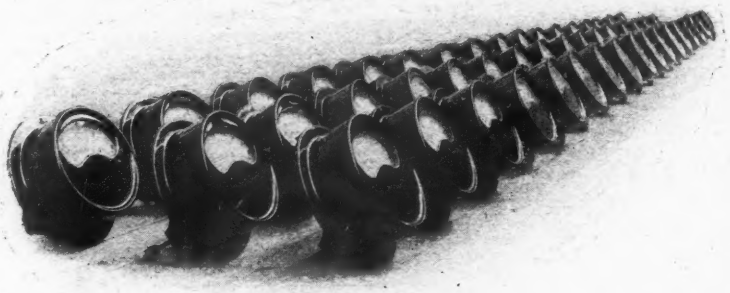

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We have indicated above a few of the extremely wide variety of instruments which we manufacture, but it requires a large catalogue to deal with them all. If you require an electrical measuring instrument of any description whatsoever, we can supply it, therefore:

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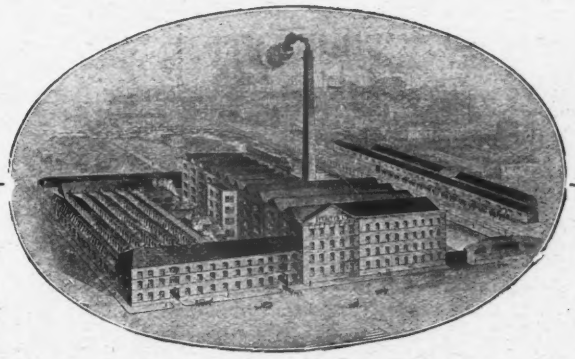
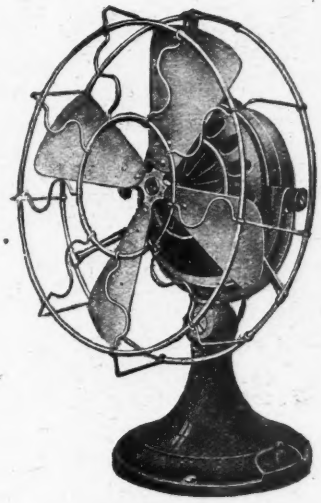


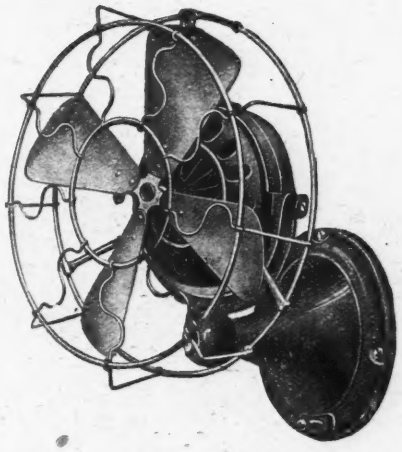
WORKS:--ASTON, BIRMINGHAM

FAN SEASON IS HERE.

"ASTON" FANS



As Desk Fan.



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ADVANTAGES:

THE MOTORS are of the well-known "Aston" type, specially designed for silent running. Tropically wound with mica insulation and impregnated under vacuum pressure, they are practically impervious to moisture.

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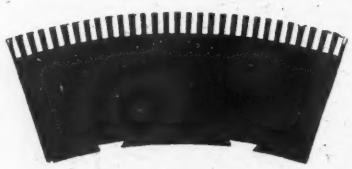

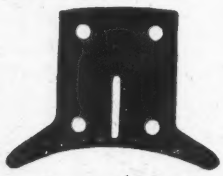

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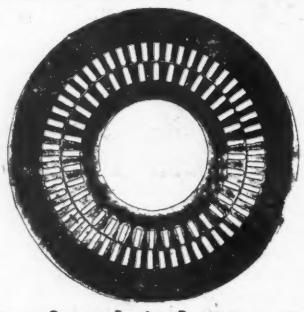

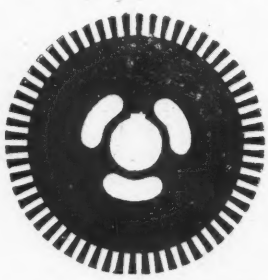

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OSCILLATING FANS.

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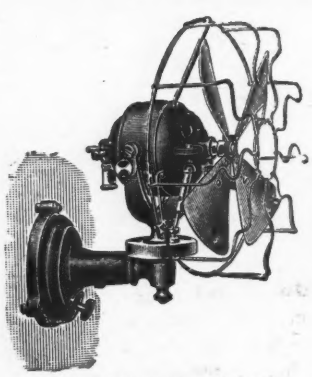

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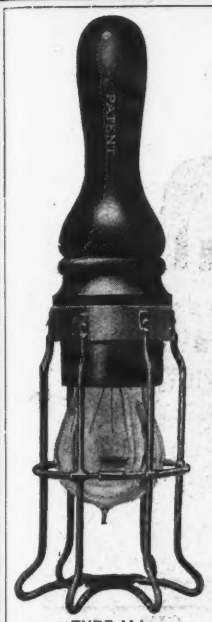

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Hospital and Inspection Hand Lamp with Aluminium Parabolic Reflector.

The accidents caused through the use of badly designed Hand Lamps (some of which have resulted fatally) prompted us among the first to introduce a thoroughly safe Hand Lamp. The "GUARDIAN" HAND LAMPS have been adopted by the leading Engineering Firms, Shipyards, Corporations and Government Departments. A feature of these Hand Lamps is that there are no screws fixed in a horizontal position. The supporting strap on the "GUARDIAN" Lamps is held by fibre pegs and bound by soldered tin wire and non-rusting.

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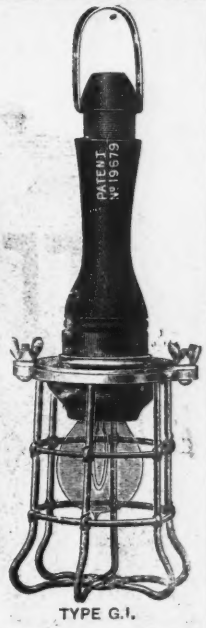

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No matter how strong, how well designed a portable apparatus may be, danger is not removed if unsuitable flexible conductors be used. That is the reason for "Anti-Shock Flexible," which is a flexible conductor embedded in a flexible insulated jacketting and finally braided overall with cotton or hard cord. For table lamps this material is braided with lustre silk of attractive appearance. Send for a sample card with prices of "Anti-Shock Flex," it fills a want.

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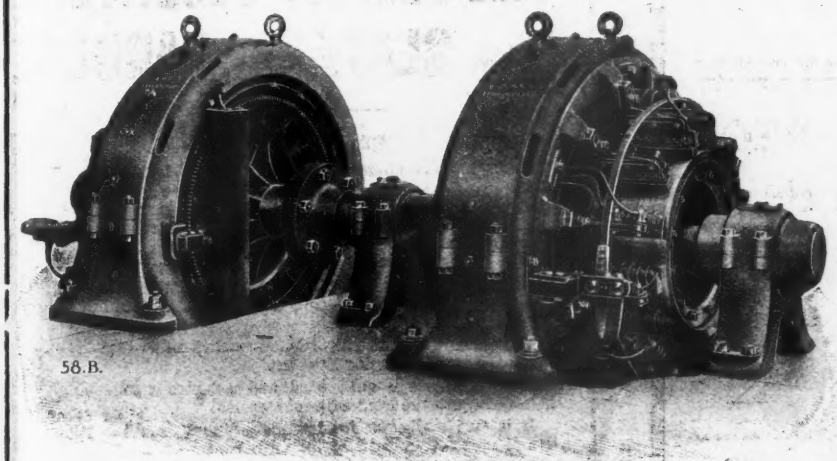

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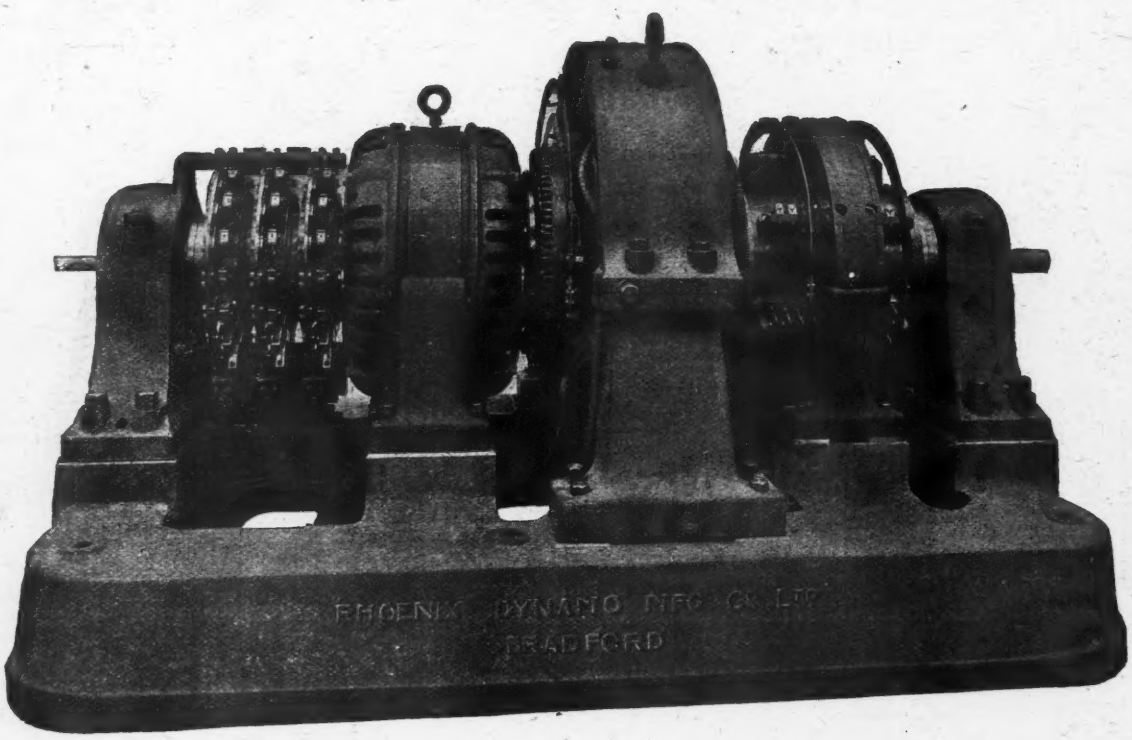

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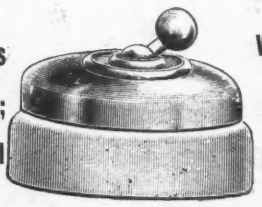

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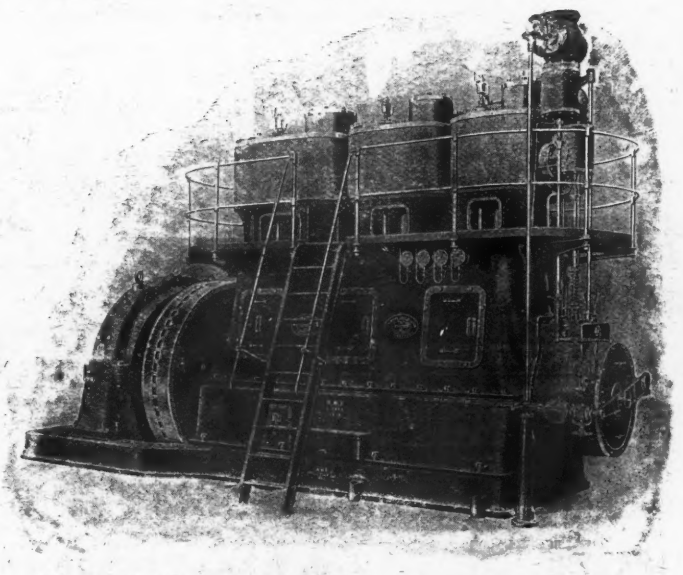

Illustration of four 400-K.W. Steam Generators supplied for the North-Western Railway of India.

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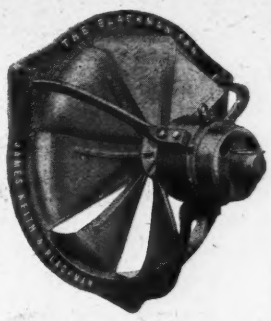

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by
Blackman Fans.

These Fans are made in many sizes, run smoothly, can be fixed in any position, deliver the largest volumes for a minimum power consumption, and give the most satisfactory service.

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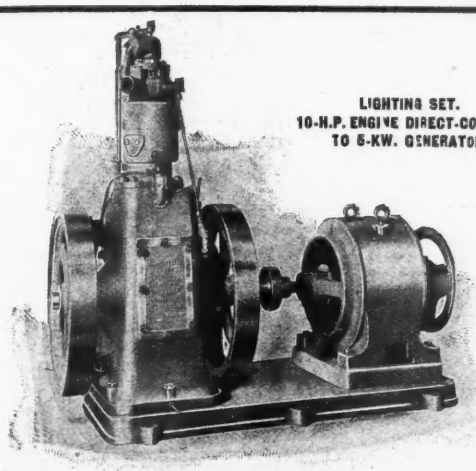
And at MANCHESTER, GLASGOW, NEWCASTLE, LEEDS, &c.



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10-H.P. ENGINE DIRECT-COUPLED TO 5-KW. GENERATOR.

A WESTINGHOUSE-CROSS OIL ENGINE—7 to 120 H.P.

—provides a reliable and effective unit for direct service or the operation of small power plant.

ITS PROMINENT FEATURES ARE :—
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STAND THE STRAIN,
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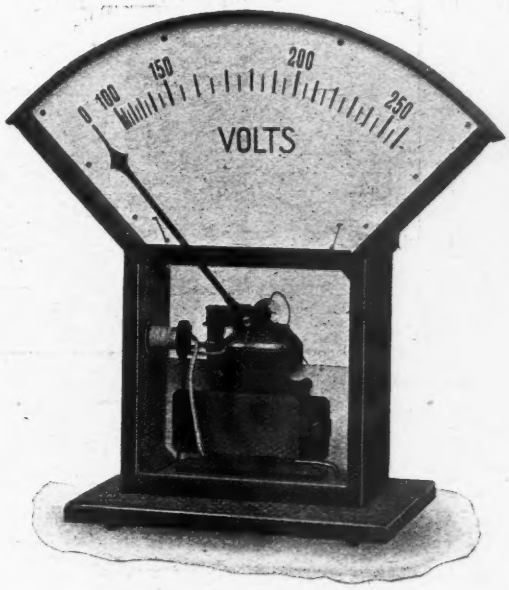
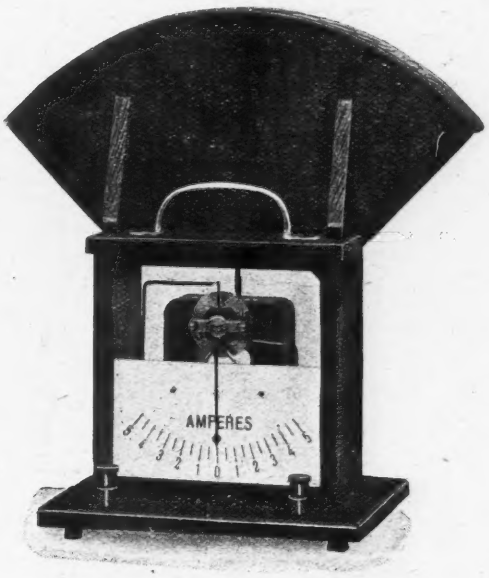
Lecture Room and School Use



Demonstration Instrument, Type A.dem, with Electro-magnetic Movement. Front view showing large scale.



Demonstration Instrument, Type D.dem, with Moving Coil and Permanent Magnet. Back view showing small scale.

These Instruments are made in the following Types :—

MOVING COIL with Permanent Magnet, for current and pressure measurements with continuous current ;

ELECTRO-MAGNETIC MOVEMENT with air damping device, for current and pressure measurements with continuous or alternating current.

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when the weather is warm is a

RELIABLE, EFFICIENT & SILENT

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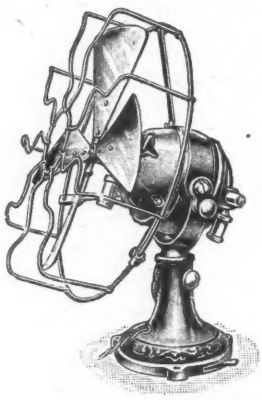
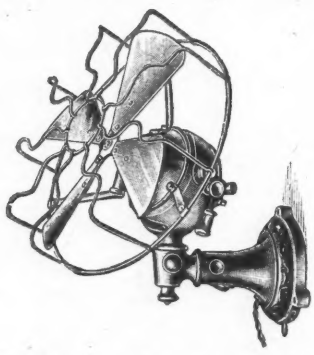


AERO FANS



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Wherever there is water — the GORDON Turbine will take the utmost possible advantage of it.

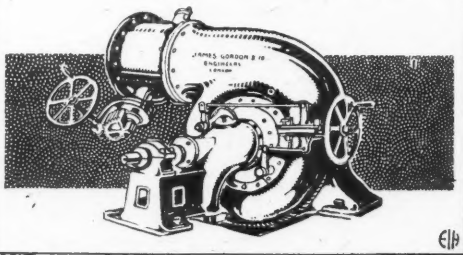
SOME time ago a body of independent engineers made a series of tests of the Gordon Water Turbines. Their *certified* reports prove that

Gordon
WATER TURBINES

have a higher efficiency and develop more power than others. These reports we should like to show you, and also explain *why* Gordon Water Turbines are ideal for country house plants, mill and factory use.

Booklet of these Foolproof Turbines, post free.

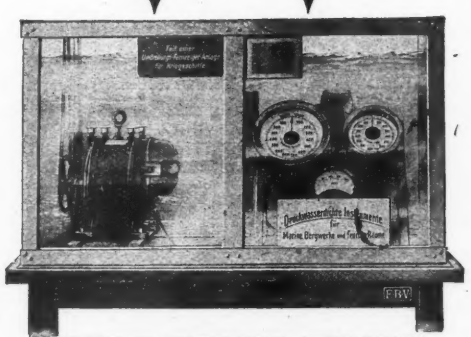
JAS. GORDON & CO.,
81, KNIGHTRIDER ST., LONDON, E.C.



The illustration below shows a combination of 2 Electrical Speed Indicators and 1 Voltmeter which

WORKED SIX MONTHS UNDER WATER

during the I.B.A. Exhibition at Leipzig, 1913. Awarded with the Highest Exhibition Premium, ROYAL SAXON STATE PRIZE.



THOROUGHLY WATERPROOF INSTRUMENTS for installation on SHIPS AND IN HUMID PLACES (MINES, &c.).

Electric Long-Distance Speed Indicators

Consisting of **DYNAMO** and **INDICATOR**, indicate instantaneously, and with aperiodic precision, the rotary speed of revolving machine shafts.

They generate their own D.C. voltage, which is transmitted by cable to the indicator (receiver). This receiver is calibrated in r.p.m., and indicates the speed on a distinct round scale.

These Instruments are: { *independent from variations of temperature, insensitive to the vibrations of the travelling ship, proof against water pressure.*

They indicate, also, the direction of rotation (besides the speed).

Electrical Testing Instruments of Waterproof Type,
For all Kinds of Currents and for all Purposes.

Maker to { ***IMPERIAL GERMAN NAVY*** / ***12 FOREIGN ADMIRALTIES*** } *and to many civil and military authorities at Home and Abroad.*

AGENTS FOR ELECTRICAL INSTRUMENTS WANTED.

Dr. Th. Horn, Leipzig, 14

If it had not been for the

Mazda

DRAWN WIRE PROCESS

the types of lamps illustrated on this page would not have been available—

(1) to the Public for greater economy in cost of light.

(2) to Central Stations in their fight against other illuminants.

(3) to Contractors in the extension of their business.

(4) to Illuminating Engineers in their work for improved lighting.

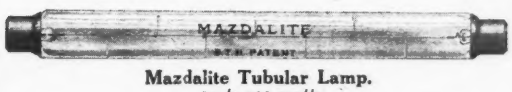
We were well within the truth when we stated in 1911 that "the Mazda Drawn Wire filament will cause a revolution in lighting"—it *has*.

Use and recommend Mazdas —the lamps which mean progress and profit for all concerned in electric lighting.

Mazda Automobile Headlight.
2 *to* 50 *watts.*

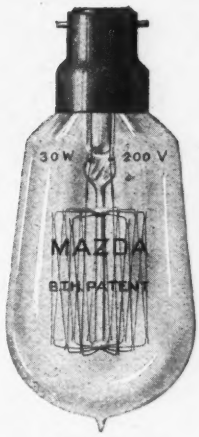
The
British Thomson-Houston Co., Ltd.,
MAZDA HOUSE, 77, UPPER THAMES ST., LONDON, E.C.

Branches at Manchester, Birmingham, Leeds, Sheffield, Newcastle, Middlesbrough, Glasgow, Swansea, Cardiff and Dublin.

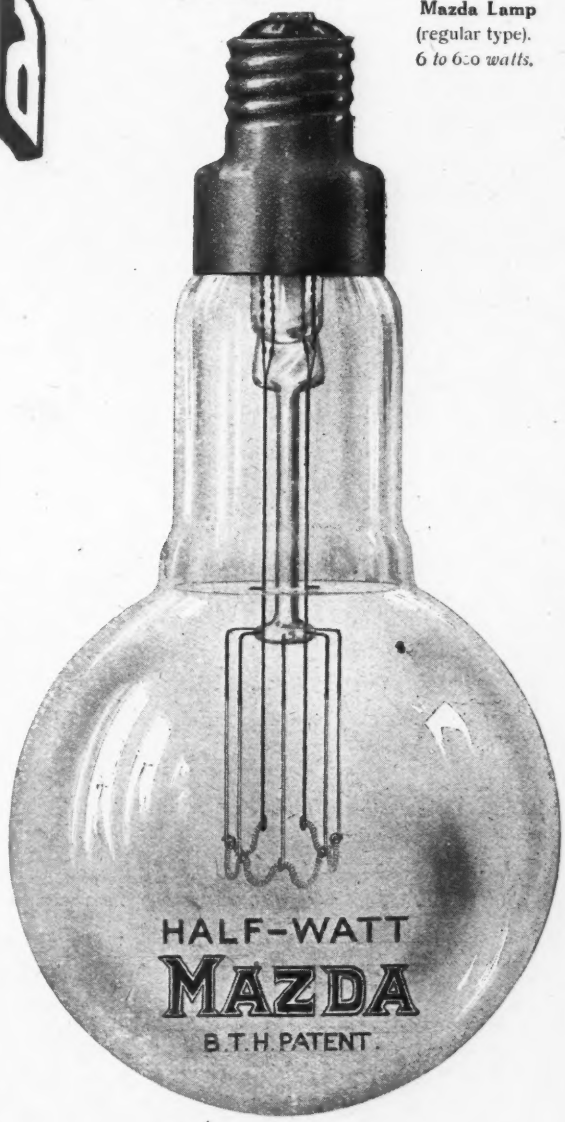


Mazdalite Tubular Lamp.
10 *to* 100 *watts.*

Mazda Focussing Lamp
(for photographers, etc.)
40 *to* 100 *watts.*

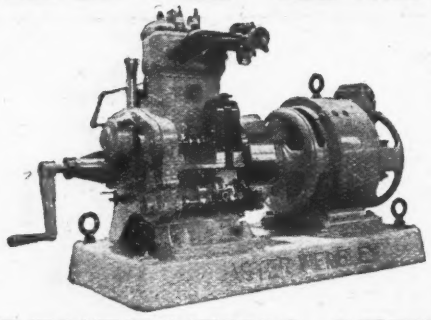


Mazda Lamp
(regular type).
6 *to* 620 *watts.*



Mazda "Half-Watt" Lamp.
300 *to* 1500 *watts.*

ASTER



GENERATING SETS.

Godbold.

— Aster Points —

In which You as an Expert will be interested.

No. 5.—Valve Doors.

The valves and tappits are entirely enclosed behind a substantial cast-iron door which is clamped up in such a manner that whilst being easily removable it makes an entirely oil-tight joint. This door prevents any oil which may work up past the tappits from the crankcase running over the engine ; at the same time it entirely deadens any slight noise which may arise from the operation of the valves, adding considerably to the neat appearance of the engine.

Write for new Catalogue, post free on application.

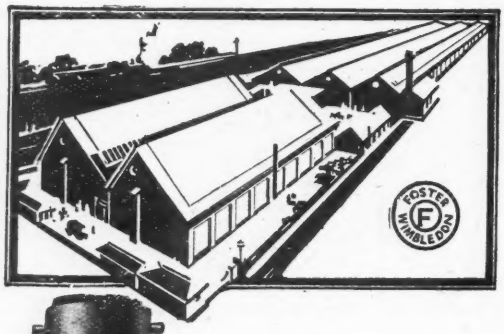
☐ **The Aster Engineering Co (1913) Ltd** ☐

WEMBLEY, MIDDLESEX.

☐ Scottish Agents : W. J. Hannah & Co., 50, Wellington St., Glasgow. ☐

Telephone—1290, 1291 *and* 170 *Wimbledon.* On ADMIRALTY, POST OFFICE, WAR OFFICE & LISTS

Telegrams. ABC Code 5th "Fosteraco". *London.*



Foster Engineering Co Ltd

Offices & Works : WIMBLEDON. LONDON SW

FOR

Strength, Light and Durability

THE

FOSTER

M.F. LAMP

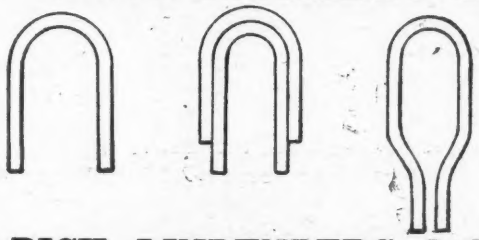
LEADS THE WAY

MADE UNDER FOSTER AND OSRAM PATENTS.

MAGNETS AND MAGNET STEEL IN BARS.

MANUFACTURED IN "HEROULT-LINDENBERG'S" ELECTRIC FURNACE.

HIGHEST PERMANENCY AND MAGNETIC STRENGTH.



LOW PRICES.

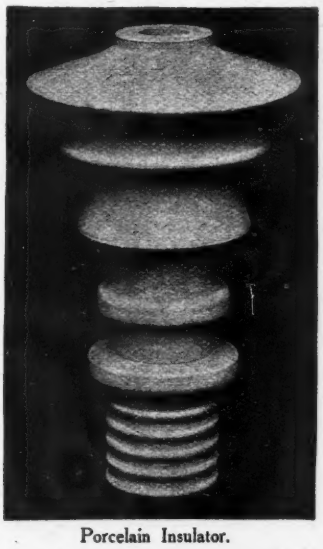
FINEST WORKMANSHIP.

STEELWORKS RICH. LINDENBERG, Ltd., Remscheid-H.

REPRESENTED BY: **FELD BROS. & CO., LTD.,** 25, Budge Row, LONDON, E.C.

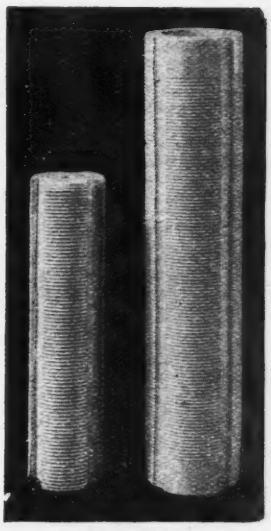
Of Unquestioned Quality

well finished and thoroughly reliable in every respect. All kinds of insulators, porcelain ware and parts supplied expeditiously.



Porcelain Insulator.

Ornamental Gold-Decorated, E.L. Fittings, suitable for Ships' use, &c., &c.



Resistance Bobbins.

V.S.M.
PORCELAIN INSULATORS

have been used for years, and are always specified by many of the leading electrical manufacturers.

Close attention is given to the suitable dimensioning of insulators, correct composition of porcelain body, and the perfecting of the process of porcelainisation.

V.S.M. porcelain ware is guaranteed suitable for the work for which it is designed, and is in constant use the world over.

The Electric & Ordnance Accessories Co., Ltd.,

Aston, Telephone: 340 East (6 lines). Telegrams: "E.O.A., Birmingham." **Birmingham.**

Hanley Works, Shelton Potteries, Hanley, Stoke-on-Trent.

Agents:

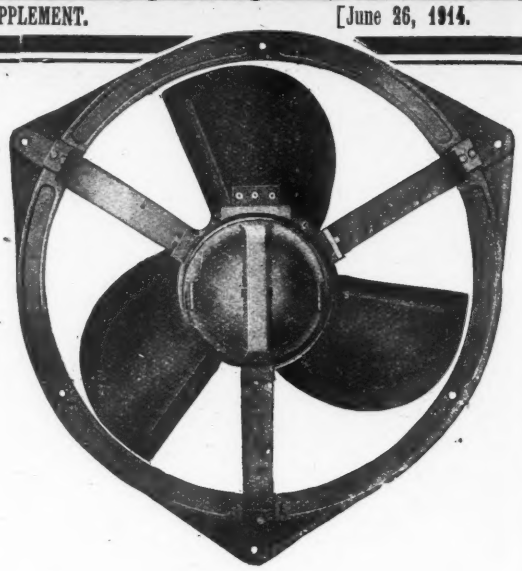
LONDON *Electrical Department*, Vickers House, Broadway, Westminster, S.W.
MANCHESTER: R. Foster, 196, Deansgate.
GLASGOW: J. & A. Anderson, 231, St. Vincent St.
SHEFFIELD: H. E. Ridley, 19, Vainor Road.
MIDLANDS: Bill & Berry, 39, Gt. Charles Street., Birmingham.

PROPRIETORS VICKERS LIMITED

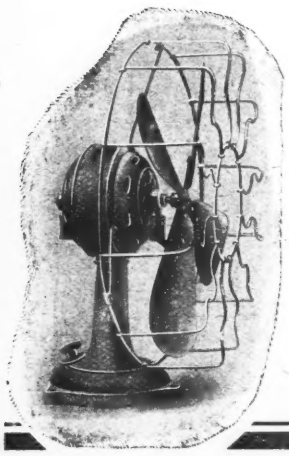
Agents:

NOTTINGHAM: F. Mansfield, 197, Station Road, Beeston, Notts.
SWANSEA: W. Ogden Dayson, 1, Mount Street.
YORKSHIRE & NORTHERN COUNTIES: F. MacCallum, Austhorpe Road, Crossgates, Leeds.
IRELAND: Hurst Electric Mfg. Co., 27 & 29, Grosvenor Road, Belfast.

Two fans you need



This SUN FAN is fitted with patent "Beedle" or propeller blades and delivers a larger volume of air with a lower consumption of current than the ordinary Box-Blade type. **Quite the most efficient ventilating fan — let us send you particulars.**



Telephone: Gerrard 2291. (3 lines).

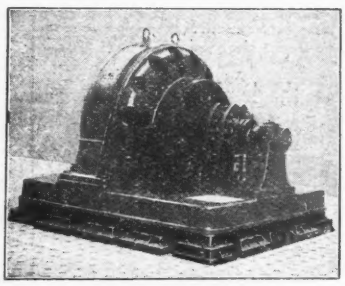
The Sun ELECTRICAL COMPANY LTD.
118-120 Charing Cross Road, London, W.C.

Telegrams: Secabilis, Ox, London.

This SUN Desk and Table Fan is listed at really competitive prices. It enables you to sell to the man who must have the cheapest article. At the same time it is in all respects reliable and efficient, and is well finished. Prices from 27/6 each (sub.). Large stocks in all standard voltages.

Send sample order now.

PREVENT TRANSMISSION OF VIBRATION AND NOISE



By using our **Patent Devices** Under your Machinery. Specify **"BAVANITE"**

Patent Iron-Framed Cork Plates **For Your Foundations.**

Thousands H.P. Isolated Steam, Gas, Oil Engines, Motors, &c.

Write for Particulars.

1,000 KW. Rotary Converter on Patent Isolators.

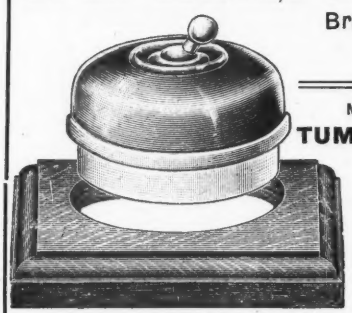
The BRITISH ANTI-VIBRATION and NOISE Co., Ltd.

5, Lloyd's Avenue, London, E.C. *Phone: 1321 Avenue.* GLASGOW OFFICE: 105, ST. VINCENT ST.

Wires—"Antinoise," Fen, London.

C. H. DAVIES & Co.,

Bracebridge Street, **BIRMINGHAM.**



MANUFACTURERS OF **TUMBLER SWITCHES, TEAK and IRON CASED FUSEBOARDS, DISTRIBUTION BOARDS,** AND ALL

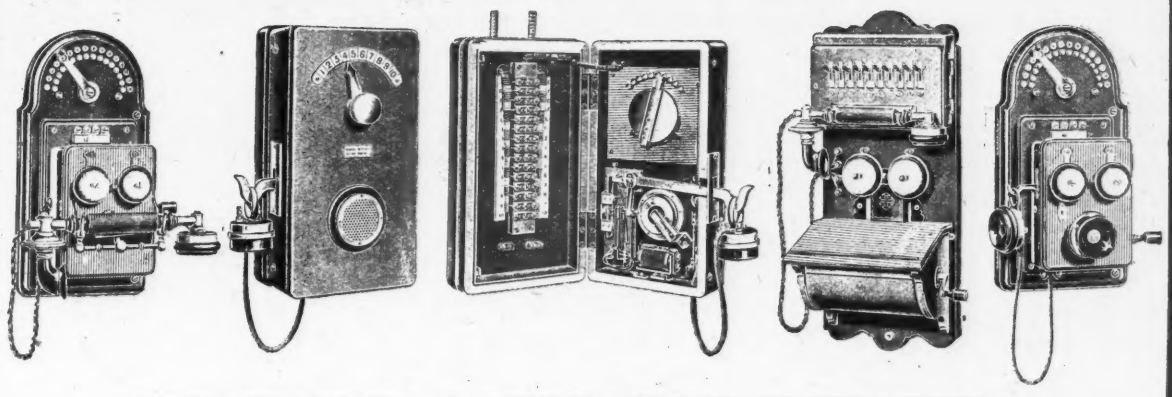
ELECTRICAL ACCESSORIES.

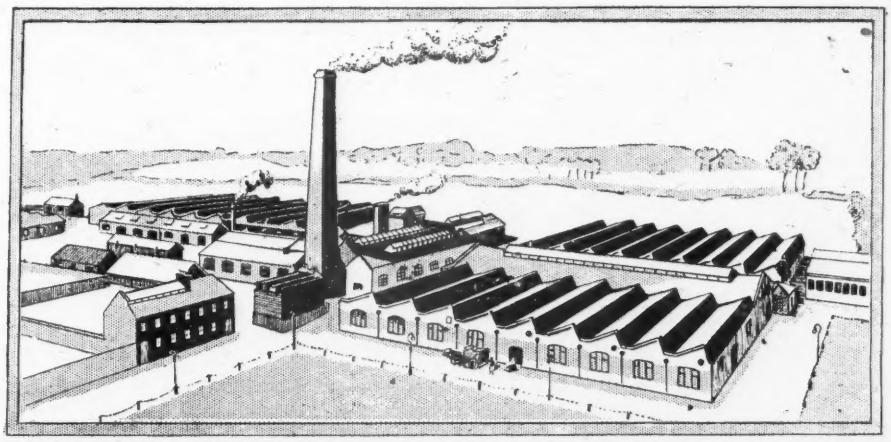
ARMSTRONG, STEVENS & SON, Ltd.,

WHITTALL STREET, BIRMINGHAM.

PRICE LIST ON APPLICATION.

INTERPHONES





STERLING TELEPHONE WORKS, DAGENHAM, ENGLAND.

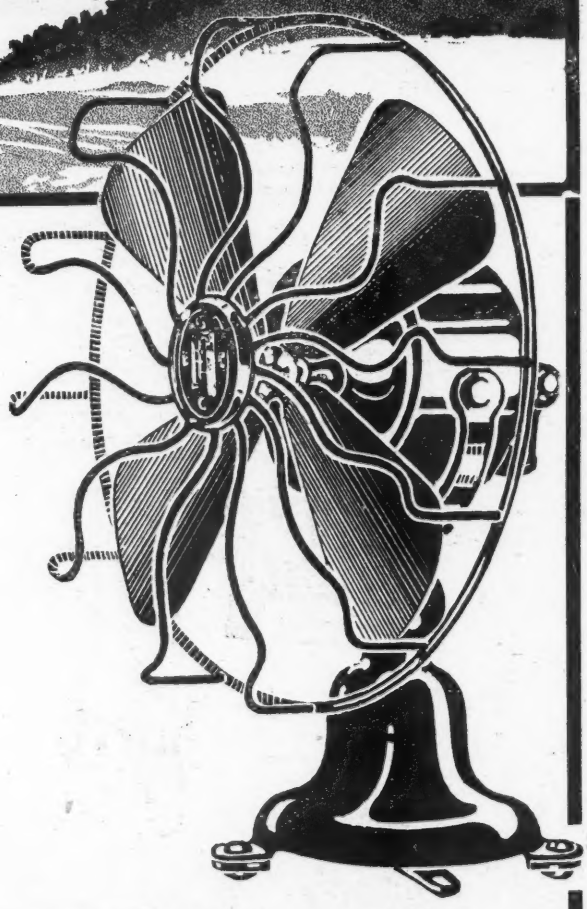
The STERLING TELEPHONE & ELECTRIC Co Ltd

TELEPHONE HOUSE

210-212, TOTTENHAM COURT ROAD, LONDON, W.

Works :- DAGENHAM, Essex, ENGLAND.

Manufacturers of Telephones for all purposes, Electric Bells, Indicators, Electric Blasting Machines, etc.



What enormous possibilities these two little words should conjure up in the minds of all "live" contractors.

Think of the numerous shop keepers to whom the question of "temperature" in the hot weather is one of vital importance, *and yet who do not realise what "Freezor" can do for them.*

Think of the numerous factory owners who should listen readily to a "fresh air" suggestion, *and yet who do not realise what "Freezor" can do for them.*

Think of the multitude of householders who would gladly welcome cooling breezes in their homes during the heat of summer, *and yet who do not realise what "Freezor" can do for them.*

It is safe to say that the vast majority do not appreciate what benefits accrue from the use of an Electric Fan—how nominal is the initial cost—how infinitesimal is the cost of maintenance.

No active campaign has ever yet been conducted in order to enlighten them, but shall these conditions still continue?

An active

"FREEZOR" ELECTRIC FAN

campaign will be conducted during the present season, in order to teach the advantages of the Electric Fan, and in particular the "FREEZOR" FAN.

Will you associate yourself with this movement and become a "Freezor" dealer. Our extensive efforts aided by your own local endeavours should produce results of material value to you.

If you have studied Electric Fans you know "Freezor" to be the best - you know how substantially constructed, how artistic in design, how silent and steady running, how economical in current consumption, how reasonable in price, how perfect in results is the "Freezor"—and, moreover, you know that we guarantee them against faulty manufacture, thus fully protecting you. Will you write us upon the lucrative proposition?

THE GENERAL ELECTRIC COMPANY, Ltd.,

REG^{D} TRADE MARK

HEAD OFFICE:—**67, Queen Victoria Street, LONDON, E.C.**

Telephones: London Wall 3600 (30 lines). *Telegrams: "Electricity Cent., London."*

Branches: Manchester, Birmingham, Glasgow, Newcastle, Cardiff, Dublin, Belfast, Bristol, Swansea, Liverpool, Leeds, Sheffield, Nottingham, Hull, Southampton, &c.

REG^{D} TRADE MARK

THE "ELECTRICAL REVIEW"

CHEAP PREPAID ADVERTISEMENTS

Relating to Situations Vacant, Situations Wanted, Businesses Wanted, Businesses for Sale, Patents for Sale, Specific Articles of any kind Wanted, or for Sale or Exchange, are inserted at the rate of ONE PENNY per Word (minimum 1s.). Box Number and "Electrical Review" Address count as Seven Words.

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LATEST TIME FOR RECEIVING 9.30 a.m. THURSDAYS.

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SEND
FOR OUR
BOOK LIST.
POST FREE.
H. ALABASTER, GATEHOUSE & CO.,
4, Ludgate Hill, London, E.C.

VALUATIONS,
AUCTIONS and
ARBITRATIONS of
Electrical Works, Plant and Stock.
WHEATLEY KIRK, PRICE & CO.
(Established 1850).
46, Watling Street, London, E.C.
16, Albert Square, Manchester.
26, Collingwood Street, Newcastle-on-Tyne.

EDUCATIONAL NOTICES.

Latest time for receiving 9.30 a.m. Thursday.

City and Guilds
TECHNICAL COLLEGE, FINSBURY,
LEONARD STREET, LONDON, E.C.

Principal: Prof. Silvanus P. Thompson, D.Sc., L.L.D., F.R.S.

FULL DAY COURSES of Instruction in—
MECHANICAL ENGINEERING.
CIVIL ENGINEERING.
ELECTRICAL ENGINEERING.
INDUSTRIAL AND TECHNICAL CHEMISTRY.

The training is adapted to the needs of various students, including (*a*) Pupils from Secondary Schools above the age of 15 who desire to receive a practical and scientific training bearing upon their future industry or profession; and (*b*) young men who, having previously served a pupilage or apprenticeship in works, desire to go through a more systematic training in Engineering and Chemical Science.

In addition to Lecture Theatres and Class Rooms the College contains Laboratories and Workshops specially equipped for instructional purposes, including, among others, Engineering and Hydraulic Laboratories, Drawing Offices, Wood and Metal Workshops, Mechanics, Physics, Electrical and Magnetic Laboratories, Dynamo and Generating Rooms and Chemical Laboratories.

The next Entrance Examination will be held on SEPTEMBER 22nd in the subjects of Mathematics and English, but the Matriculation Examination of any British University is accepted instead.

The Fees are £20 per annum.

The Programme of the College, giving particulars of Admission, Entrance Examination, Syllabuses of Instruction, the careers to which the training afforded at the College leads, and other information, may be had post free on application to the REGISTRAR OF THE COLLEGE, at the above address. 5274

EDUCATIONAL NOTICES.—*Continued.*

THE MANCHESTER MUNICIPAL
SCHOOL OF TECHNOLOGY
(UNIVERSITY OF MANCHESTER).

PRINCIPAL: J. C. M. GARNETT, M.A. (late Fellow of Trinity College, Cambridge).

The Session 1914-15 will open on 6th October. Matriculation and Entrance Examinations will be held in July and September.

The Prospectus, forwarded free on application, gives particulars of the Courses leading to the Manchester University Degrees in the Faculty of Technology, in the following Departments:—

MECHANICAL ENGINEERING,
ELECTRICAL ENGINEERING,
SANITARY ENGINEERING (including Municipal Engineering),
THE CHEMICAL INDUSTRIES (including General Chemical Technology, Bleaching, Dyeing, Printing, Papermaking, Brewing and Metallurgy),
THE TEXTILE INDUSTRIES,
PHOTOGRAPHY AND THE PRINTING CRAFTS,
ARCHITECTURE. 5275

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Unless otherwise instructed, all letters received in answer to advertisements with a box number are forwarded nightly. Postages incurred are charged at cost.

WIRELESS, Inland and Cable Telegraphy.—THE BRITISH SCHOOL OF TELEGRAPHY, LTD., offers excellent facilities to young gentlemen, age 16 to 24, for training as Wireless and Cable Operators. 467 appointments obtained during past four years. Owns three fully licensed Wireless Stations fitted with Standard Power Sets. Recognised by Cable and Wireless Companies as the best equipped school in the Kingdom. Day and evening classes. Board residence arranged if desired.—Illustrated prospectus free from the SECRETARY, 179, Clapham Road, London, S.W. 4665

SITUATIONS VACANT.

Latest time for receiving 9.30 a.m. Thursday.

If letters are not to be delivered to certain firms or individuals (if known), instructions to that effect should be sent to the Manager of the ELECTRICAL REVIEW, who will do his best to carry out such instructions. Letters of applicants cannot in such cases be returned to them, nor can the names of Advertisers using a number in any way be disclosed.

Original Testimonials should never be sent.

URBAN DISTRICT COUNCIL OF CLECKHEATON.

Electricity Works.

WANTED Switchboard Attendant capable of taking charge of an 8-hour shift, tramway and lighting. Wages 26s. per week.—Apply, with age and references, to ELECTRICAL ENGINEER, Electricity Works, Cleckheaton. 5413

(*Continued on next page.*)

SITUATIONS VACANT.—*Continued.*

SHANGHAI.

THE SHANGHAI MUNICIPAL COUNCIL require an Assistant Storekeeper for their Electricity Department. Candidates must have had good experience in charge of Stores of a large Electrical Undertaking, or of Wiring Contractors. Engagement for three years; strict medical examination necessary. Salary 160 taels per month (equivalent to about £21), rising in the second year to 170, and in the third year to 180 taels. Free second-class passage *viâ* Siberia provided. Candidates should be unmarried. Applications in writing, with copies of recent testimonials, names of references as to personal character, &c., to be sent to Messrs. PREECE, CARDEW & SNELL, 8, Queen Anne's Gate, Westminster, S.W., not later than THURSDAY, 2nd JULY, 1914. Envelopes to be marked "SHANGHAI, STOREKEEPER." 5414

ASSISTANT TELEGRAPH ENGINEER required by Gold Coast Government. Salary £400 p.a. Free single quarters or allowance of 5s. a day in lieu. Two months' leave on full pay after 12 months' service, increased to four months if returning, full pay during voyages and free passages.

Candidates must have thorough technical and practical knowledge of Telegraphy and Telephony, have practical experience of Magneto-ringing, Common Battery and Lamp Signalling Systems of Telephony, and should thoroughly understand line construction and maintenance and control of labour. Applications, with full particulars, should be sent to Messrs. PREECE, CARDEW & SNELL, 8, Queen Anne's Gate, S.W. Quote M/6989 on envelope. 5440

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Unless otherwise instructed, all letters received in answer to advertisements with a box number are forwarded nightly. Postages incurred are charged at cost.

ADVERTISING Salesman required by leading manufacturers of electric lighting appliances, experienced in catalogue compiling, circularising work and general trade advertising.—Write full particulars, experience, salary, &c., 5454, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

A.E.G. Foreign Department, Berlin, require services two Project Engineers immediately, previous experience estimating for plant essential; knowledge of German desirable. (*a*) Salary about £165 per annum; good knowledge French required. (*b*) Salary £155 to £160 per annum according to ability.—Write full details experience with copies testimonials and photograph to 5438, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ASSISTANT to Works Foreman, with drawing office experience preferred. Salary 25s. to 30s. to start depending on experience. — Apply WESTMINSTER ENGINEERING CO., Willesden Junction, N.W. 5435

ASSISTANT to Boiler House Foreman wanted for a large power station in the Midlands. Must be experienced man, able to do all work in connection with the cleaning and repair of Babcock boilers, chain-grate stokers, &c. No others need apply. Wages commencing at 8½d. per hour, 56-hour week. — Apply RESIDENT ENGINEER, Power Station, Downing Street, Smethwick, Staffs. 4756

ASSISTANT Supplies Manager required for leading electrical engineering firm in the Midlands.—Apply stating age, experience and salary required, 4656, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ASSISTANT Testers for Electrical Laboratory. Excellent opportunities for suitable men who must have had some previous technical training in theoretical electrical engineering.—Write details experience, age, salary expected, WORKS DEPT., B.T.H. Co., Rugby. 5415

BOROUGH Electrical Engineer, large Midland town, has vacancy for Articled Pupil, lighting, power and traction. Good opportunities.—5330, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

BRANCH Manager for Glasgow.—Important firm manufacturing cable, conduit, &c., requires the services of a Manager for established Glasgow Branch. Must be gentleman of good address, with thoroughly established connection in Scotland among wiring contractors, supply authorities, works, yards, &c. Lasting, adequately remunerated position affording ample scope to good man.—Applicants should state full record in confidence to 4732, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

SITUATIONS VACANT.—*Continued.*

CANVASSING Assistant for Lighting and small power users required by Power Company. Salary and commission.—Application stating age, experience and salary required, to THE LANCASHIRE ELECTRIC POWER CO., 196, Deansgate, Manchester. 5426

DRAUGHTSMAN, having experience in design of three-phase L.T. oil-immersed starters. Must be capable designer, and conversant with technical details. — Apply stating age, experience and salary required, and when at liberty, to 5423, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

DRAUGHTSMAN required, having experience in barrel type controllers, for works in the Midland district. Permanency for suitable man. Apply stating experience, age and salary expected, to 5407, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Chargeman wanted to take charge of Electrical work on Cruiser now building on the Tyne. — State age, experience and wage required, 5418, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICIAN required immediately, competent to instal and maintain D.C. motor and controller and general electrical work. — Apply stating experience, age, and wages required, 4813, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ESTIMATING Clerk required for all classes of power and telephone cables.—State age, experience and salary required, to "ESTIMATING," The Union Cable Co., Ltd., Dagenham Dock, Essex. 5452

ESTIMATING Engineer for H.T. and L.T. switchgear manufactory in Manchester district, must be good correspondent and generally competent.—Apply stating experience, salary and age 5455, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ESTIMATING Engineer wanted Machine Dept., also Sales Engineer to acquire business from industrial machine manufacturers. — Applications stating age, salary and experience, to THE ELECTRICAL CO., LTD., 122, Charing Cross Road. 5424

EXPERIENCED Salesman to organise for next season's sales of high-class Continental carbon lamps and lighting accessories in Scotland and North of England. Preference given to man having thorough knowledge of the trade.—Apply, giving full particulars of qualifications, stating salary, or salary and commission basis if desired, to 5279, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

JOINTER wanted for high-pressure cables, must be able to do own plumbing. Upstanding wage 42s. Permanency for competent man.—Write HENDON ELECTRIC SUPPLY CO., LTD., 10, The Promenade, Golders Green, N.W. 4655

LABORATORY Assistant required by large electrical manufacturing firm in Midlands for experimental and research work. Technical training equivalent to University degree essential, and some practical experience of general electrical testing desirable. —State age, full particulars of technical training, practical experience and salary required, to 5432, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

LINESMAN and Telephone Engineer required for India. Must be thoroughly qualified in telephone and high-tension transmission line work. Salary £300, with bungalow accommodation and certain allowances, subject to terms of a three years' contract.—5433, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

PLUMBER-Jointer, must be used to concentric cables, permanent situation.—State wage required, together with references, MINEHEAD ELECTRIC SUPPLY CO., LTD., 5, Friday Street, Minehead. 5298

PREMIUM Pupil.—Vacancy occurs in High-tension Single-phase Alternating-current Works for young man with technical training, practical experience with turbines, mains, sub-stations and workshop.—Apply BOROUGH ELECTRICAL ENGINEER, Hastings. 4735

REQUIRED by a large wholesale house, 2 Representatives to travel Yorkshire and Lancashire for electrical supplies; first-class men with live connection need only reply. State salary, experience and references.—5362, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

REQUIRED, several smart Salesmen by a well-known electric lamp factory. Must have good connection in London, Midland and Lancashire districts.—Applications, stating age, experience and remuneration required, to 5422, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

(*Continued on next page.*)

SITUATIONS VACANT.—*Continued.*

SALESMAN required for cable and wire business. Good connection in London and district, and knowledge of the trade essential.—Write stating age, experience and salary required, to "ELECTRIC," c/o J. W. Vickers & Co., Ltd., 5, Nicholas Lane, E.C. 5437

SMART Tramway Clerk wanted for abstracting traffic receipts, mileage, &c. Must be absolutely accurate and reliable. Commencing 25s. per week. State experience and enclose copies of testimonials.—RHONDDA TRAMWAYS CO., LTD., Porth (Glam.). 4847

STOREKEEPER, Junior, good opening; previous experience essential. Personal application preferred.—HIGGS, Sherbourne Road, Balsall Heath, Birmingham. 5421

SUB-Station Attendant required immediately on E.H.T. system; must be accustomed to synchronous motor-generators, battery, together with boosters. Commencing salary 30s. per week, rising to 35s. per week.—Apply by letter only, endorsed "Sub-Station Attendant," to SOUTH LANCASHIRE TRAMWAYS CO., Atherton, Lancs. 5436

SWITCHBOARD Attendant wanted with experience in D.C. and A.C. plant; wages 20s. per week, rising to 30s.—Applications, stating age, experience and qualifications, to be addressed to BOROUGH ELECTRICAL ENGINEER, Spa Road, Bolton. 5369

SWITCHBOARD Attendant required at once with experience in three-wire direct-current station. Wages 30s. per week of 56 hours.— Apply stating age, with copies of testimonials, to THE ENGINEER, Electricity Supply Corporation, 93, High Road, Chiswick. 4848

TEST-Room Assistant required for Cable Factory in Lancashire.—Apply, stating experience and salary required, 5218, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

TESTERS wanted by firm of electrical engineers in Lancashire, used to testing all kinds of A.C. and D.C. machines. Permanencies for suitable men.—State age, experience and salary required, 4310, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

TRANSFORMER Senior Draughtsman required in London district. To have good experience in standard oil-immersed work. Will be responsible for checking drawings.—Apply giving full particulars, 5448, **ELECTRICAL REVIEW, 4, Ludgate Hill, London.**

VACANCY for Junior Assistant Engineer for sub-station and distribution work. Applicants must be over 18 years of age, and have had a mechanical training and some electrical experience. Salary 20s. per week, rising 2s. 6d. per week each six months to 30s.—Apply, giving full particulars of experience and enclosing copies of references, to THE FIFE ELECTRIC POWER CO., 8, New Row, Dunfermline. 5427

WANTED, a capable Shop Foreman to take charge of small brass factory; good organiser and disciplinarian, able to get work through promptly and accurately. Apply stating wages required and experience, as well as class of work accustomed.—5363, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Cable Jointers.—Permanent positions for capable plumber jointers, with experience on paper, lead-covered power and telephone cables and bitumen cables, with leading firm of cable makers.—5321, **ELECTRICAL REVIEW, 4, Ludgate Hill, London.**

WANTED, First-class Draughtsman for switchgear design, experienced in mining switchgear a recommendation, good salary to competent man.—5398, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED immediately, first-class Jointer, must do own plumbing.—Apply stating age, previous experience and wages required, to S. WILLIAMS, Electricity Works, Wishaw, N.B. 5447

WANTED at once, capable Assistant to take charge of electric lighting department, solicit orders and prepare estimates. Must have thorough knowledge of this branch.—Apply stating age, height, salary and copies of references, T. M. KINGDON & CO., Ironmongers and Engineers, Basingstoke. 5451

WANTED, good mechanical Draughtsman, one having Turbo-Alternator experience preferred.—Apply stating full particulars, age, and salary expected, to CHIEF DRAUGHTSMAN, Siemens Brothers Dynamo Works, Ltd., Stafford. 5446

WANTED at once, practical man for wire covering, as Foreman.—Write PERCY GREEN, 93, Aldersgate Street, London. 4805

SITUATIONS VACANT.—*Continued.*

WANTED.—Electric Light Co., East of Scotland, requires Jointer-Wireman. Wage 35s. per week.—Apply 5445, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, Sub-station Attendant for rotary converter sub-station in Scotland; E.H.T. and D.C. experience essential. State age and full details of experience in reply. Wages to commence 30s. per week, increasing to 40s.—5444, **ELECTRICAL REVIEW, 4, Ludgate Hill, London.**

WANTED, Assistant Tester with experience of A.C. and D.C. machines, also turbo and dynamo alternators.—Apply stating age, experience and salary required, to 5443, **ELECTRICAL REVIEW, 4, Ludgate Hill, London.**

WANTED in London, Assistant, with good general engineering training and practical experience in drawing office; able to take out quantities, make estimates, draw up specifications, &c., for plant and machinery required for large works.—Write, giving full particulars of experience, age and salary expected, to Box N., c/o Burtons, General Buildings, Aldwych, London. 4823

WANTED, good-class Traveller in provinces; some electrical knowledge preferred. Salary £250 per annum and expenses.—Address particulars Box 482, Watson's, 6, Bouverie Street, E.C. 4809

WANTED, Assistant Mechanical Engineer, experienced in the maintenance and operation of large electric power station machinery, turbines, boilers, &c. Salary £156 per annum, with good prospects of promotion.—Applications stating age, and technical training and practical experience, to be addressed to W. B. WOODHOUSE, Yorkshire Electric Power Co., Wellington Road, Dewsbury, marked (A.M.E.). 4806

WANTED by large electrical manufacturing firm, competent Draughtsman on D.C. and A.C. work.—State age, experience and salary required, to 5430, ELECTRICAL **REVIEW, 4, Ludgate** Hill, **London.**

WANTED, first-class Electrician, capable of maintaining 20 lighting sets and magnetos.—Address full particulars to Box 480, Watson's, 6, Bouverie Street, E.C. 4798

WANTED immediately, competent Meter Tester, to take charge of and to inspect the D.C. and A.C. meters of a traction and lighting company in South Wales; commencing salary 32s. 6d. per week; only competent men need apply.—5419, **ELECTRICAL REVIEW, 4, Ludgate Hill,** London.

WANTED, young Electrical Engineer, well up in three-phase working, to go to India as leading hand in the erection of a plant and then stay in charge on a three years' agreement.—Apply with testimonials, stating age, experience, salary (without which no application will be entertained), &c., to 5416, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WIREMAN wanted, South Wales; must be thoroughly experienced, good workman.—Send copies testimonials 4802, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

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ASSOCIATION of Electrical Station Engineers.—Apply immediately for full particulars to W. J. EBBEN, Hon. General Secretary, 41, Warren Road, Leyton, London, N.E. (Telephone: Stratford 905.) 4779

If letters are not to be delivered to certain firms or individuals (if known), instructions to that effect should be sent to the Manager of the ELECTRICAL REVIEW, who will do his best to carry out such instructions. Letters of applicants cannot in such cases be returned to them, nor can the names of Advertisers using a number in any way be disclosed.

APPOINTMENTS FILLED.

APPLICANTS for Engineer-on-Watch, Box 4789, are thanked, the position is now filled. 4832

BOX No. 5270.—Applicants are thanked, and informed that the position is now filled. 5457

(Continued on next page.)

SITUATIONS WANTED.

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A CAPABLE and all-round electrical mechanic, duly qualified to maintain large works plant, used to heavy electrical machinery and switchgear, &c., A.C. and D.C., and able to carry out all repairs; moderate wage.—T. R. Y., 10, Ash Road, Woodhey, Rockferry, Birkenhead. 4831

A CAPABLE Energetic Engineer with 10 years' experience, both technical and commercial, of train, 'bus and car lighting systems, together with the latest experience in the design of electric starters for motor cars, desires responsible position.—4846, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

A COMPETENT Electrician and Mechanic, 16 years' experience all branches, able to estimate.—L., 88, Choumert Road, Peckham. 4811

ABLE Engineer, first-class designer and draughtsman, college, works, business training, knowledge languages; practical organiser with wide experience, electrical and mechanical lines, desires to change his present position. Best references.—4815, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ABLE, Competent and Practical Electrical Engineer (26), used to control of men and maintenance of large plant, A.C. and D.C., including generators, motors, mains lighting and power station, gas and steam driven. Wages about 50s.—4711, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ADVERTISER (30), 13 years' experience, power house, tramways, mains, &c., requires responsible position.—4834, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ADVERTISER seeks Situation with contractor doing country-house lighting in all counties, able to take charge; tubing, casing, Henley or Stannos.—Apply, 4816, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

AN Illuminating Engineer (25) desires position as specialist in this field. M.Sc. (honours) in electrical engineering; four years' experience with largest firms and in central station work; first-class testimonials.—4829, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

AS Foreman-Electrician or working, 16 years' charge hand, principal contractors. High-class or competitive work.—4853, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

CENTRAL Station Engineer, electrical and mechanical (32), A.M.I.E.E., 13 years' experience, several years as chief assistant in large supply station, desires responsible position abroad. Excellent references.—4714, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

COMMERCIAL Engineer (27½), desires responsible position; public school, technical, works, station, travelling. Managed contracting business four years.—4768, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

DISENGAGED Electrician; complete plant or wiring.—19, Grove Road, North Finchley. 4765

ELECTRICAL Engineer (41) requires appointment; office, test, works, shift or bench; good refs.; 45s.—4703, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Engineer (33), with workshop and office training, also large experience in erecting of installations, seeks responsible position with firm of contractors. London preferred.—5336, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL Engineer (24) desires engagement; 5 years' works experience, 2 years' technical; good motor-tester.—13, Queen Street, Haverhill. 4737

ELECTRICAL Engineer (24), technical training, works, testing and administrative experience, desires position as representative or in sales office.—WHEELER, 55, Myddelton Square, London. 4797

SITUATIONS WANTED.—*Continued.*

ELECTRICAL Engineer, experienced in underground, overhead, and any electrical work outside the generating station, desires change, with fixed residence.—4849, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICAL mechanic desires appointment where thorough knowledge of motors, A.C. or D.C., will be of use. Good wireman and fitter, used to steam and internal combustion engines and machinery generally.—M., 44, Abbey Road, Croydon. 4673

ELECTRICAL Storekeeper (28) desires re-engagement; good references.—A., 55, Albert Road, Penge. 4781

ELECTRICAL Wireman, good, wants work; good refs.; town or country.—ELECTRICIAN, 10, Blandford Street, W. 4828

ELECTRICIAN, experienced, suit factory, motors, lighting, wiring, care of machinery; all own repairs; London or suburbs.—POWELL, 127, Gladstone Avenue, Wood Green. 4580

ELECTRICIAN desires change; 13 years' experience, manufacturing, maintenance of large works' plants, charge of present one; good winder.—4657, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICIAN seeks situation; Country house, factory, small station, or offers.—4723, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICIAN seeks situation; long experience installing and maintaining motors, generators, accumulators, &c., also thorough experience in wiring.—E., 53, Hunsdon Road, New Cross Gate. 4681

ELECTRICIAN and Mate seek piecework; light, 'phones, bells, motors, builders or otherwise; town or country; excellent references.—ELECTRICIAN, 361, St. John's Street, E.C. 4824

ELECTRICIAN, lighting, bells, telephones, &c., wants work.—R., 425, King's Road, Chelsea. 4826

ELECTRICIAN (24), suit factory; motors, lighting, telephones, all own repairs.—4817, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICIAN (30), charge of plant, arcs, power, wiring, erecting, repairs. Excellent references. Distance no object.—J. F., 32, Skeffington Road, East Ham, Essex. 4821

ELECTRICIAN, experienced all branches, quick, reliable wireman; anywhere; references.—60, Hornsey Road, N. 4835

ELECTRICIAN-Mechanic desires situation; telephone linesman and overhead power-work construction, high-tension plant and general wiring; five years' Continental experience; fluent Spanish and Portuguese.—4736, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICIAN-Salesman, working, would like change, seven years' working experience, wiring, motors, accumulators, telephones, arcs, &c.; 12 months' superintending jobs and getting fresh business. Age 24. Home or abroad.—4830, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ELECTRICIAN'S Assistant disengaged; good all-round knowledge, own tools (non-union).—WILSON, 16, Cricklewood Lane, Cricklewood, N.W. 4820

ENERGETIC young business man desires position where it is possible to acquire a practical or technical knowledge, London or provinces. At present engaged with large electrical firm. Scope and advancement essential.—4822, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ENGINEER-Draughtsman, requires position, 10½ years' electrical-mechanical experience. London district preferred.—4770, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

EXPORT Trade.—Qualified Engineer, thoroughly practical, good commercial ability, English, German, French correspondent, extensive marine electrical experience, offers services.—4750, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOREMAN Electrician (Fitter), first-class experience plants, telephones, wiring, contracts, good at repairs.—E.S., 64a, Uxbridge Road, Shepherd's Bush. 4845

(Continued on next page.)

SITUATIONS WANTED.—*Continued.*

HANDY Man, young, all-round electrical, wiring, workshop, plant, constant, tools.—4746, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

HAS any Firm opening for really capable man; 10 years' experience in electrical and automobile trades, wiring, fitting, sales, repairs, estimating; first-class references.—4837, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

IMPROVER (20) requires situation; 3 years' references.—F. CHANTER, 233, Lillie Road, Fulham, S.W. 4693

MECHANIC with small well-equipped private workshop wants mechanical and experimental work. Small and accurate work a speciality.—F. P., 38, Abbeville Road, Clapham, S.W. 4755

TELEPHONE Fitter, overhead work, electric clocks.—N., 41, Arragon Road, East Ham. 4697

WIREMAN. Motors, lighting, bells, &c., seven years' experience.—B., 260, Shirland Road, W. 4827

WIREMAN, good general hand, thoroughly reliable, just disengaged.—"ELECTRICIAN," 1, Crossley Terrace, Liverpool Road, N. 4825

WIREMAN wants work, good all-round; 11 years' experience; town or country.—JAMES, 13, Ladbroke Crescent, Notting Hill. 4844

WIREMAN seeks employment, good all-round.—P., 7, Market Street, Stepney, E. 4842

WIREMAN, 14 years' experience, good references.—C. ELLIS, 32, Smith Street, Chelsea. 4685

WIREMAN (young) seeks situation, any distance.—STEVENS, 77, New King's Road, Fulham. 4833

WIREMAN, all systems, references.—R., 10, Aspenlea Road, Hammersmith, W. 4838

WIREMAN, disengaged, screwed tube, &c.—SHOTTER, 72, Salford Road, Streatham Hill. 4839

WIREMAN and Mate requires work, builders or otherwise.—22, Lancaster Road, Ealing. 4796

WIREMAN and Mate wants job; lights, bells, motors, &c.—R., 5, Queen's Road, Dalston. 4841

WIREMAN-Improver, good experience, screwed barrel.—P., 1, Olinda Road, Stamford Hill. 4850

WIREMAN-Improver (20), good experience in all branches.—H. S., 29, Leghorn Road, Harlesden, N.W. 4836

WIREMAN'S Mate, experienced, requires sit.—4843, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

PARTNERSHIPS.

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ENGINEER, A.M.I.C.E., A.M.I.E.E. (age 29), seeks responsible post. Would invest £500.—4803, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED by an established firm of Ironfounders and Engineers in South-West Lancashire who have buildings, land and power to spare to meet with someone with available capital and experience. Willing to join in making electrical disconnecting, service boxes, feeder pillars and similar work. Principals only.—Apply in strict confidence to E. W. WHITE & SONS, Chartered Accountants, Liverpool. 5458

AGENCIES.

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A GENTLEMAN representing a well-known and large firm of gas and oil engine makers would like to take up an Agency for Electric Motors, on a commission basis.—4740, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ESTABLISHED Office in Westminster with good connections is willing to take up an exclusive Electrical Agency for London.—4812, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

LIVE Agents required for Yorkshire, Durham, Lancashire, and South Wales areas, to push sale of latest Disc Electric Coal-cutters. Only firms willing to treat Agency with earnestness which it deserves need apply.—5456, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR SALE.

FOR SALE.

250-KW. Generating Set, three-crank comp. engine, 220-volt generator.
75-KW. Generating Set, two-crank comp. engine, 110-volt generator.
150-KW. Dynamo, 4-pole, compound wound, 273 amps., 500 volts, 550 revs.
Motor-Driven Hydraulic Pump, three 1½ in. rams, 3½ in. stroke.
36 in. D.G. Vertical Boring and Turning Mill (by Baush and Harris), two balanced tool boxes.
Two Richards Vertical Boring and Turning Mills, to swing about 32 in., one balanced tool box.
Two A. Acme four-spindle Automatic Screw Machines, to take bars up to 1¼ in.
Four Acme four-spindle Automatic Screw Machines, to take bars up to 1¼ in.
Bilgrim No. 3 Semi-Automatic Bevel Gear Planing Machine, take wheels up to 29 in.
Fellows Gear Shaper, for 36 in. × 5 in. external and 28 in. × 3 in. internal gears.

CATALOGUE of Stock MACHINERY. 2-3000 LOTS, free on application. Inspection invited.

THOS. W. WARD, LTD., ALBION WORKS,
Tel.: "Forward, Sheffield." SHEFFIELD.

ELECTRICAL PLANT FOR SALE.

TENDERS are invited by the Metropolitan Asylums Board for the purchase of complete Electrical Generating Plants, Motors, &c., at the Brook Hospital, Shooter's Hill Road, Woolwich, and the Park Hospital for Children, Hither Green, S.E.
The plants for disposal consist of:—

BROOK HOSPITAL.

(*a*) Steam Dynamos and Accessories, Steam and Exhaust Connections, Motor Booster and Switchboard.
(*b*) Storage Battery.
(*c*) Electric Motors and Accessories in Engine Room.

PARK HOSPITAL FOR CHILDREN.

(*d*) Steam Dynamos and Accessories, Steam and Exhaust Connections, &c.; Switchboard, &c.

A detailed Schedule and Form of Tender upon which alone applications will be considered, may be obtained from the undersigned. The plants are at present in thorough working order, and may be inspected and seen under working conditions at the Hospitals, between the hours of 10 a.m. and 4 p.m., on ordinary week days, and 10 a.m. and 12 noon on Saturdays, upon production of the Form of Tender.
The Managers will not necessarily accept the highest or any Tender, and reserve the right of disposing of the Plant as a whole or in four sections as stated.
Tenders must be delivered at the office of the Board not later than 2.30 o'clock p.m. on WEDNESDAY, the 1ST JULY, 1914.

By Order,
T. DUNCOMBE MANN,
Clerk to the Board.

18th June, 1914. 5409

(Continued on next page.)

FOR SALE.—*Continued.*

COUNTY BOROUGH OF DEVONPORT.

Electricity Department.

FOR disposal, in order to make room for larger plant, a 150-KW. D.C. Browett & Lindley-E.C.C. Generating Set, voltage 460/585, working pressure 150 lbs. per sq. in., speed 350 r.p.m. It can be used either as a shunt or compound machine, and can be used condensing or non-condensing.

The plant is in good working condition, and can be seen at work on full load by appointment.

The undersigned will be pleased to receive offers.

J. W. SPARK,
Borough Electrical Engineer.

Electricity Works,
East Stonehouse, Devon,
22nd June, 1914. 5412

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CABLE Casings to compete against any manufacturers in the World. Trade discounts on application. Creosoted troughing and timber for underground work, also woodwork of all descriptions for home or export. Send 1s. 6d. for List and rule.—JENNINGS' Co., Timber Merchants, General Woodworkers, 991, Pennywell Road, Bristol. 7508

COOPER Hewitt Lamps (16), type "AH" D.C. pattern, in perfect condition with new tubes having maker's guarantee. Good reasons for disposal.—What offers to F. J., 2, Talbot Road, Alexandra Park, N. 5417

DYNAMOS, 3000, 1500, 1000 and 750 amperes at 6 volts, ready for delivery; also smaller sizes delivered from stock. Machines let out on hire.—CANNING & Co., Electro-Platers' Engineers, Birmingham.

ELECTRIC Motors, several almost new, 460 volts D.C.; also several 230 volts D.C.; seen running, approval; sizes to 15 H.P.—SUGDEN, 80, Boundary Road, Barking. 4676

ELECTRIC Motors, 1 to 40 H.P., tested and guaranteed; large surplus stock cheap, or hire.—ELECTRO-GENERATOR Co., 1A, Shepherd's Bush Road. 'Phone, 488 Hammersmith. 4715

FOR Sale, combined Electric Lighting Belliss-Morcom-Crompton Generating Set, consisting of Belliss & Morcom Engine with extended bedplate and direct-coupled to one Crompton shunt-wound Generator, 80 amps. 140 volts, 500 R.P.M., suitable for working at 60 lbs. steam pressure. The Set is in excellent condition, guaranteed to be in working order, and may be seen working in North Wales by appointment.—Apply W. J. FURSE & Co., LTD., Electrical Engineers, Traffic Street, Nottingham. 5425

FOR Sale, Crossley Electric Lighting Engine, P.E. type, about 18 B.H.P., complete with heavy fly-wheel, tanks, pipes, belt and tools; and Crompton Dynamo, 115 volts, 90 amperes, 1000 revs., complete with fly-wheel, slide rails and switchboard; all in good order. Can be seen working at Messrs. J. FISK & SONS, LTD., High Street, St. Albans, who are about to take supply from public mains. 4795

FOR Sale, one Rectifier; has been used for two mercury-vapour lamps to a 200-volt, 50-cycle A.C. circuit.—4814, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR Sale, regular supplies of 1½ and 2½ second-hand Hand Tapes, also Canvas in strips from 3 in. wide to 6 ft. wide.—4818, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR Immediate Sale, Two Country House Lighting Sets in Perfect Condition.—9-H.P. "Crypto" Oil Engine, direct-connected to dynamo, 25 volts, and 2-H.P. "Crypto" Oil Engine, direct-connected to dynamo, 25 volts, complete with all accessories, including tanks, piping, beautifully polished slate switchboards, &c. Cost when new over £300. Have only been in use a few months. Exceptionally easy to handle and economical to run. Guaranteed in perfect working order. Can be inspected by appointment. What offers? Owner's present requirements necessitate more elaborate plant.—Apply by letter, CANTOPHER, 50, Gresham Street, London, E.C. 4819

FOR SALE.—*Continued.*

FOR Sale, A.C. Motor, 15-H.P., 970 revs., 205 volts; 50 cycles; three-phase, Machinenfabrik Oerlikon, No. 21,050, practically new, starting resistances and switch; about £25.—4800, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR Sale, 7½-H.P. 400-volt Motor (new), D.C., Perfecta starter, D.P. switch and fuse; also others.—A. UNDERWOOD, 3, Queen Street, E.C. 4794

FOR Sale, one superior Vertical High-speed Engine, enclosed type, 200 H.P., fitted with extended soleplate for carrying dynamo; cheap before removal.—5954, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR Sale, Electric Plant as under:—One, equal to new, 100-KW. Belliss-Morcom "Balancer" Electric Generating Set, 230 v.; one 200-H.P. Willans Vertical High-Speed Engine with extended sole-plate for carrying Dynamo.—RIDDEL & Co., 40, St. Enoch Square, Glasgow. 9732

FOR Sale, in the County of Durham, 250-KW. Generating Set, by Scott & Mountain in 1903 consisting of:—Compound high-speed, three-crank Engine (coupled direct to Generator), H.P. cylinders, 14 in. diameter, L.P. cylinders 18½ in., stroke 10 in., speed 375 R.P.M., Dynamo of the three-phase alternating type with direct coupled exciter and having revolving magnets and fixed armature. Total K.V.A. 250, volts 500, 50 cycles. Also Main Switchboard, Switches, &c. The plant is in first-class order and can be inspected by appointment.—5334, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

FOR Sale, 50-volt, 2-H.P. shunt-wound Crompton Motor with starter.—Offers, G. TROTTER, "Gerston," Storrington. 4677

FOR Sale, two 123-ampere-hour Storage Batteries each consisting of 125 P11 type E.P.S. cells in lead-lined teak boxes, including all stands, &c.; two P.D.M. Motor Generators, 120 volts, 90 amps., complete with two switchboards mounted with meters, switches, &c., for charge and discharge.—5450, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

MOTOR-Generator, in absolutely new condition, complete with switches and resistance (maker, Newtons, Taunton); Motor, 480-volt; Generator, 100-volt, 60-amp. On view London.—Offers wanted by GOLDSTON, Marefair, Northampton. 4748

MOTORS, direct-current, 1, 6, 10, 12, 15 and 30 H.P., all 110 volts; also compound Dynamo, 110 volts 200 amps.—ROBINSON & HANDS, Barwick Street, Birmingham. 4783

MOTORS for sale or hire:—110 volts—4 B.H.P., 8 B.H.P., 9 B.H.P., 28 B.H.P., 75 B.H.P.; 220 volts—1½ B.H.P., 10 B.H.P., 30 B.H.P., 48 B.H.P., 105 B.H.P., also 1 B.H.P. with worm gear: 440 volts—3 B.H.P. with back gear, 30 B.H.P. with worm gear, 40 B.H.P. with pulley; 220 volts—5 B.H.P., 3-phase, 50 periods; 400 volts—20 B.H.P. 3-phase, 40 periods.—5439, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ONE ½ D.C. Motor, 110 volts; one D.C. 220, 30s. each; one ½ Alternating 200, 50, 35s., all new.—4840, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

PARKER Dynamo, 220 v., 120 amperes, compound wound.—MARTIN, Witton Road, Birmingham. 4587

SEARCHLIGHTS for Sale or Hire.—THE LONDON ELECTRIC FIRM, George Street, Croydon. 2879

STEAM Electric Generating Sets.—Two 275-KW., one 75-KW., 500 volts; one 325-KW., one 325-Dynamo (only), two 160-KW., 230 volts. Electric Capstans (three), 500-volt, standard size, D.C. Motors. Electrical Testing and Measuring Instruments. A.C. and D.C. Motors. Immediate delivery.—JENNINGS, West Walls, Newcastle-on-Tyne, and 93-94, Chancery Lane, London, W.C. 9982

THE Electricity Committee of the Ashton-under-Lyne Corporation invite tenders for the purchase of disused Brockie-Pell arc lamps, Hyde Park carriers and old lamp caps. Further particulars and form of tender may be obtained from the Borough Electrical Engineer, Wellington Road, Ashton-under-Lyne. Sealed tenders addressed to the undersigned must be received not later than noon Wednesday, 1st July, 1914. By order, JOHN NEAL, Borough Comptroller, Town Hall, Ashton-under-Lyne, 17th June, 1914. 5403

(Continued on next page.)

FOR SALE.—*Continued.*

TWO 750-KW. Turbo-Generator Sets (Willans-Parsons) 440 volts, three-phase, 25 periods, with condensing plants, air pumps, &c., practically new; 100-KW. Generating Set, 220/250 volts; 25-KW., ditto, 110 volts; 12-KW. Generator (by G.E.C.) four-pole modern type; also in stock Steam and Gas Engines, Boilers, Pumps, and every description of high-class plant.—HARRY H. GARDAM AND CO., LTD., Staines. 5420

70-H.P. six-pole interpole Motor, 460 v., 200 R.P.M.; four 10-H.P., 230-volt Motors.—MARTIN, Witton Road, Birmingham. 4586

115-volt 75-KW. direct-coupled Steam Set, by Anderston Foundry and C.I.E; only run five years; cheap to save removal.—DRUMMOND & CO., Commercial Street, Middlesbrough. 4852

50,000 Metallic Filament Lamps for sale, high and low voltages, 8½d. each.—Write MARTIN, MARTIN AND CO., 2, Upper James Street, W. 4692

BUSINESSES FOR SALE AND WANTED.

Cheap prepaid Advertisements are inserted under this heading at the rate of One Penny Per Word (minimum 1s.). Three Consecutive Insertions for the price of two, if ordered and prepaid with first insertion.
Box Number and ELECTRICAL REVIEW address count as seven words.

Where Advertisements are to be answered to a given number at the ELECTRICAL REVIEW Office, applications for names and addresses of the Advertisers will be entirely disregarded.

Unless otherwise instructed, all letters received in answer to advertisements with a box number are forwarded nightly. Postages incurred are charged at cost.

ELECTRICAL Contracting and Maintenance Business for Sale (City). Established connection; profitable trade. Low price for quick settlement. Owner going abroad.—4808, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ARTICLES WANTED.

Cheap prepaid Advertisements are inserted under this heading at the rate of One Penny Per Word (minimum 1s.). Three Consecutive Insertions for the price of two, if ordered and prepaid with first insertion.
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Unless otherwise instructed, all letters received in answer to advertisements with a box number are forwarded nightly. Postages incurred are charged at cost.

ACCUMULATORS wanted for refining purposes. Obsolete Generating Sets, Dynamos, Motors, and all kinds of Machinery. Scrap Cable, Arc Lamps, Meters, Metal Residues, and Scrap Metals of every description purchased for prompt cash, town or country.—Apply A. BROWN & SONS, 142, Lower Clapton Road, London, N.E. Telephone, Dalston 555; Telegrams, Secondhand, Lowclap, London. Established 1860. 4362

ANY description of Obsolete Generating Plants, Dynamos, Batteries, Motors, Transformers, Old Arc Lamps, Meters, Cables, Scrap Metals, Metallic Drosses, &c., &c., wanted for prompt cash.—Town or country.—A. LEAROYD, Bridge Works, Heatherley Street, Clapton, N.E. Telephone: Dalston 2278. 4019

MANUFACTURERS, motors for lifts, also worm and worm-wheel reducing gears.—Send catalogue and quotations to 4799, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

OLD Electric Lamp Tops, Cable and Wire bought for cash.—SMITH & CO., 2, Ranelagh Road, East Ham, London, E.

PLATINUM in any form and quantity, purchased at highest prices by DERBY & CO., LTD., 44, Clerkenwell Road, London.

SMALL Motor-Alternator and Transformer required for pressure testing up to 25,000 volts. Voltage of supply, 400 D.C.—5431, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

THERMO Couples and Recorder for temperatures ranging from 500/800 deg. Fahr.—5453, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

ARTICLES WANTED.—*Continued.*

TWO Motors, second-hand, 20/25 H.P. and 25/30 H.P., D.C., 200 volts, speed not exceeding 750 R.P.M. State maker, age, condition, and where seen.—4664, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED.—Old Electric Lamp Tops, Scrap Platinum, Mercury, False Teeth, Metals, Rubber, Cables, &c.—Atlas Works, Umfreville Road, Harringay. 4738

WANTED, Alternating Motors (second-hand) 200 and 500-H.P., three-phase, 50 periods, 500-550 volts.—Reply, stating maker's name, date when built and price, to H.R.E., c/o Streets, 30, Cornhill, London. 4741

WANTED, Steam Generating Set, 300-KW., three-phase, 50 periods, 550 volts, steam pressure 80 lb.; superheat, 100 deg. Fahr. State age, condition, makers, where seen, &c.—9766, ELECTRICAL REVIEW, 4, Ludgate Hill, London.

WANTED, good second-hand Generating Set, about 100-125 KW. on a 500-550-volt circuit D.C., for a steam pressure, say, 100-150 lb.; compound-wound machine, 4-6 poles, up-to-date and in good working order; vertical engine preferred. State where can be seen, also price wanted.—Apply WILLIAM HARRISON, LTD., Brownhills Collieries, near Walsall. 5449

WANTED to Purchase: Dynamos, Motors, Arc Lamps, Cable, Plant and Machinery of any description; Scrap Iron, Metals, &c., for cash.—'Phone 3339 Hop; or J. HYAMS, 11, Glengall Terrace, Old Kent Road. 4807

WANTED, a second-hand three-phase Alternator, direct driven by a high-speed marine-type steam engine; kilowatts, 50 to 75; periodicity, 50; volts, 230; star wound.—Apply at HEWENS, 324, High Street, Lewisham. 4804

WORKSHOPS, PREMISES AND SITES TO LET OR WANTED.

Cheap prepaid Advertisements are inserted under this heading at the rate of One Penny Per Word (minimum 1s.). Three Consecutive Insertions for the price of two, if ordered and prepaid with first insertion.
Box Number and ELECTRICAL REVIEW address count as seven words.

Where Advertisements are to be answered to a given number at the ELECTRICAL REVIEW Office, applications for names and addresses of the Advertisers will be entirely disregarded.

Unless otherwise instructed, all letters received in answer to advertisements with a box number are forwarded nightly. Postages incurred are charged at cost.

TO Engineers and Manufacturers.—Freehold Factory Premises for Sale or to be Let; centre of London delivery radius; electric power available. Three floors (each 44 ft. by 18 ft.); Store (60 ft. by 9 ft.); large yard (75 ft. by 70 ft.). Every accommodation for large staff. Suitable as a Factory in almost any branch of the practical trades. Total area about 8,000 ft. Nine-roomed double-fronted house adjoining.—Apply "FREEHOLDER," c/o Dawson's, 121, Cannon Street, London, E.C. 4801

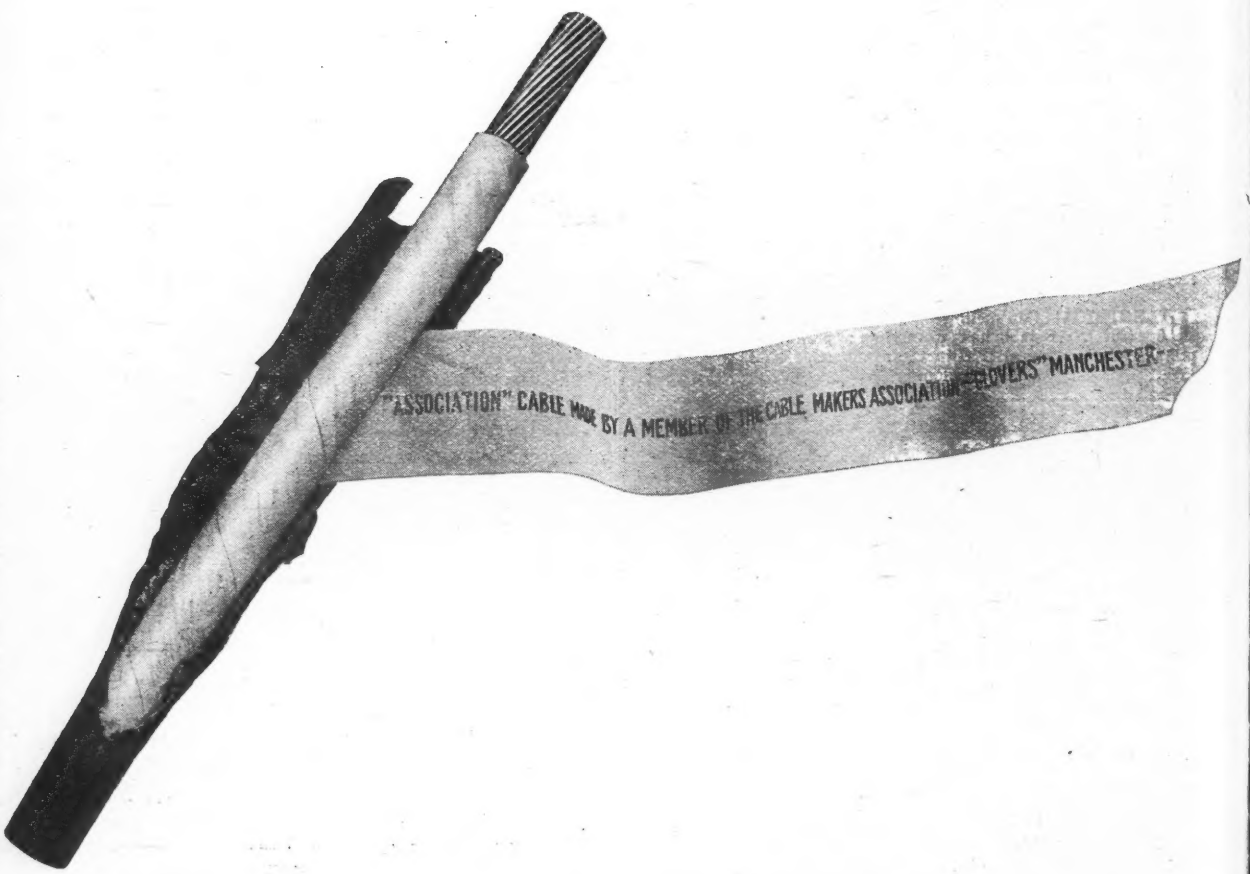
Where Advertisements are to be answered to a given number at the ELECTRICAL REVIEW Office, Applications for names and addresses of the Advertisers will be entirely disregarded, and Letters giving incorrect Box Numbers will be destroyed.

NOTICE.

OWING to the many hundreds of replies passing through this Office each week, we would ask those answering Advertisements to be EXTREMELY ACCURATE with regard to the figures WHEN ADDRESSING REPLIES to Box Numbers.

LOOK FOR THE NAME ON THE TAPE,

"GLOVERS, MANCHESTER."



W. T. GLOVER & CO., LTD.,

TRAFFORD PARK,

MANCHESTER.

SIEMENS

WOTAN

LAMPS

—Standard, Half-Watt & Daylight—

all have

Strong *Drawn Wire* filaments.

WOTAN DAYLIGHT LAMPS

give a profusion of light in which colours can be easily matched. This is due to the special nature of the bulb employed. They are therefore specially suitable for Drapery Stores, Studios, Colour Warehouses, &c.

WOTAN HALF-WATT LAMPS

are noted for High Efficiency, and for large areas such as Thoroughfares, Arcades, Concert Halls, &c., are unsurpassed for excellence of lighting.

WOTAN STANDARD LAMPS are being used in thousands of installations all over the world, where they are giving complete satisfaction.

REMUNERATIVE DISCOUNTS TO THE TRADE. **DELIVERIES FROM STOCK.**

Price List and Quotation on application.

SIEMENS BROTHERS DYNAMO WORKS LIMITED.

Head Office:
CAXTON HOUSE, WESTMINSTER, S.W.
Telephone: GERRARD 860.
Telegrams: "SIEMBRALOS VIC. LONDON."

Supplies Dept. & Stores:
38 & 39, UPPER THAMES STREET, E.C.
Telephone: CITY 5350.
Telegrams: "SIEMOTOR CENT. LONDON."

"Tantalum" Lamps & Fittings:
TYSSEN STREET, DALSTON, N.E.
Telephones: CENTRAL 8387/9 & DALSTON 2440.
Telegrams: "SIEMODYN KINLAND LONDON."

Works: STAFFORD.

BRANCHES:

AUCKLAND (N.Z.)	CALCUTTA	GLASGOW	MELBOURNE	OSAKA	SHANGHAI	TOKYO
BIRMINGHAM	CAPE TOWN	HONG KONG	MEXICO	PEKIN	SHEFFIELD	TORONTO
BOMBAY	CARDIFF	JOHANNESBURG	MONTREAL	PENANG	SINGAPORE	VALPARAISO
BRISTOL	DUNEDIN (N.Z.)	MADRAS	NEWCASTLE	RANGOON	SOUTHAMPTON	WELLINGTON (N.Z.)
BUENOS AYRES	DURBAN	MANCHESTER	NEW YORK	RIO DE JANEIRO	SYDNEY	WINNIPEG

KINDLY NOTE!

NALDER BROS. & THOMPSON'S, Ltd.,

NEW ADDRESS

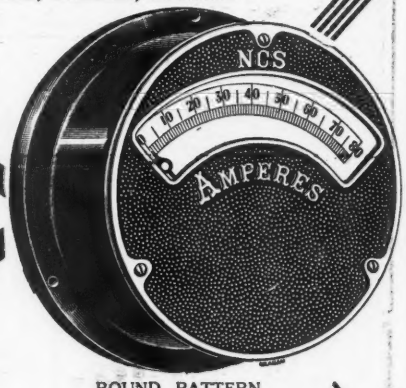
97a, DALSTON LANE, LONDON, N.E.

Telephone: 2365 Dalston (2 lines). Telegrams: "Occlude, Kinland, London."

WHERE THE FOLLOWING

CONTROLLER PATTERN,
in 5", 6" and 8" Dials.

N.C.S. INSTRUMENTS can be obtained as well as from our usual agents



ROUND PATTERN,
in 3" 5" 6", 8" and 11" Dials.

Soft Iron, Moving Coil and Dynamometer Instruments in all Shapes and Sizes.

One Quality only-the BEST

Made by Instrument Makers who are Engineers *for* Engineers.

Reasonable Prices

WRITE - FOR - LISTS.

F. REID, FERENS & Co.,

ORCHARD STREET,

NEWCASTLE-UPON-TYNE.

Specialists in the erection and repair of all types of chimneys. Steel or Brick Chimneys heightened or repaired without stoppage of works.

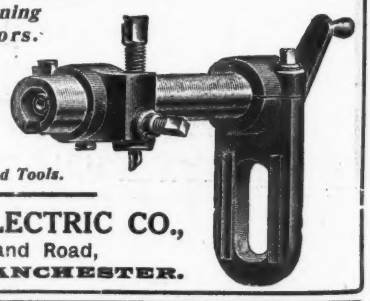
Cooling Towers painted with our special Compound to prevent Rot.

ESTIMATES FREE. *DISTANCE NO OBJECT.*

Telegraphic Address: "CHIMNEYS, NEWCASTLE-UPON-TYNE."
Telephone: 1900 CENTRAL. 529 CITY.

'UNICA' Sediment Pump

for effective cleaning of accumulators.



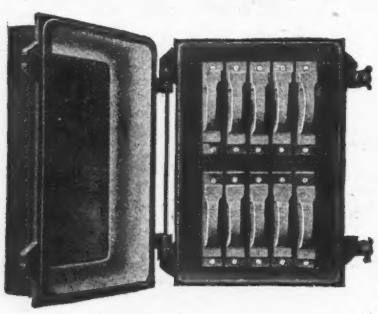
"HANDY" Commutator Grinders, *from* £3 10 0.

Small Electric Motors and Tools.

POLYSTAT ELECTRIC CO.,
226, Marsland Road,
SALE, near MANCHESTER.

AJAX H.O. Ironclad Fuse Boards.

Hope's Patent No. 29,631 of 1910 ∴ ∴ ∴ ∴ ∴ "All metal parts entirely enclosed."



Solid Lids.

All Sizes from Stock.

To comply with the latest recommendations of H.M. Inspector of Factories ...

The Board with the Fuse Bridges removed.

PARMITER, HOPE & SUGDEN, Limited,

We will send, carriage paid, New List or Sample Board.

HULME ELECTRICAL WORKS, MANCHESTER.

Telegrams: "Terminal, Manchester." Telephone: 1902 Central, Manchester.

DISPLAYED ADVERTISEMENTS

ADVERTISERS will please note that NEW COPY and ALTERATIONS to Existing Advertisements (with Blocks) should reach here not later than MONDAY MORNING.

The ELECTRICAL REVIEW is the recognised Medium of the Electrical Trades, and has BY FAR THE LARGEST CIRCULATION of any Electrical Industrial Paper in Great Britain.

NOTICES RELATING TO PATENTS.

Latest time for receiving 9.30 a.m. Thursday.

PATENTS.
TRADE MARKS.
DESIGNS.
HENRY SKERRETT, Chartered Patent Agent,
24, TEMPLE ROW, BIRMINGHAM.

John E. Raworth,
Queen Anne's Chambers, 28, The Broadway, Westminster, S.W. **Chartered Patent Agent.**

THE Proprietor of the Patents 15,991 of 1909 and 26,341 of 1911, for an "Improved Electric Locking and Unlocking Device for Locks," and "Improvements in Electric Locking Devices for Locks," is desirous of entering into arrangements by way of licence and otherwise on reasonable terms for the purpose of exploiting the same and ensuring their full development and practical working in this country. All communications to HASELTINE, LAKE & CO., Chartered Patent Agents and Consulting Engineers, 28, Southampton Buildings, Chancery Lane, London, W.C. 5392

ELECTRIC Ignition Apparatus.—British Patents 12,820, 19,525, 26,225, of 1910, and 16,875, 16,878, 21,025, of 1911. German Patent 242,316, and United States Patents 979,912, 1,010,211. The above valuable patent rights are for sale, together or separately; correspondence invited. J. B. BROOKS & CO., LTD., Birmingham. 5384

OFFICIAL NOTICES.

Latest time for receiving 9.30 a.m. Thursday.

BALLAGHADEREEN, CO. ROSCOMMON.

THE BALLAGHADEREEN ELECTRIC LIGHTING COMMITTEE invite Tenders for the following works in connection with the extension of the Electricity supply plant:

Section 1.—Hydraulic Turbine and Accessories.
Section 2.—Dynamo and Reducer Set.
Section 3.—Aerial Line.
Section 4.—Switchgear.

Copies of General Conditions, Specifications and Plans may be seen at the office of the undersigned, 27, Castlewood Avenue, Rathmines, Dublin, or copies may be obtained at the cost of production.

Tenders, sealed and endorsed "Electric Lighting Tender," are to be addressed to the Chairman, the Ballaghadereen Electric Lighting Committee, Ballaghadereen, Co. Roscommon, so as to be delivered not later than the 6th JULY prox.

The Committee do not bind themselves to accept the lowest or any Tender.

LOUIS J. LAWLESS, A.I.E.E.,
Consulting Engineer.

15th June, 1914. 5355

COUNTY BOROUGH OF WARRINGTON

Electricity Department.

THE Electricity and Tramways Committee of the County Borough of Warrington invite Tenders for the supply of High and Low Tension Cable.

Specification and Form of Tender can be obtained from the undersigned on payment of One Guinea, which will be returned on receipt of a *bona-fide* tender. Five shillings will be charged for extra copies of Specification.

Tenders, addressed to the Chairman of the Electricity and Tramways Committee, Town Hall, Warrington, must be sealed with wax and endorsed "Tender for Cable," and delivered not later than 12 o'clock noon on WEDNESDAY, JULY 8th, 1914.

The lowest or any Tender will not necessarily be accepted.

F. V. L. MATHIAS,
Borough Electrical and Tramways Engineer.

Howley, Warrington. 5434

OFFICIAL NOTICES.—*Continued.*

METROPOLITAN BOROUGH OF HACKNEY.

Electricity Department.

SUPPLY OF ARC LAMP CARBONS.

THE COUNCIL of the Metropolitan Borough of Hackney are prepared to receive Tenders for the supply and delivery at their Electricity Works, Millfields Road, Clapton, N.E., of:—

SECTION 1.—Open type White Arc Lamp Carbons, 80,000 pairs.
SECTION 2.—Yellow Flame Arc Lamp Carbons, 100,000 pairs.

The Council reserve to themselves the right to make a separate Contract for the supply of the Carbons included in either Section.

Tenders, enclosed in envelopes sealed with sealing wax and endorsed, "Tenders for Carbons," must be delivered by the persons tendering or their authorised representative, to the Chairman, at a meeting of the Tenders Committee of the Borough Council, to be held at the Town Hall, Mare Street, Hackney, N.E., on THURSDAY, JULY 9th, 1914, at 6.30 p.m., or sent by registered post addressed to the Chairman of the Tenders Committee, so as to be delivered not later than the time stated. Tenders sent otherwise will not be considered.

Duplicate copies of the Specification, Conditions, Contract and Form of Tender may be had on application to the Borough Electrical Engineer, 306, Mare Street, Hackney, on production of a receipt for the sum of £1, which sum must be forwarded to the undersigned, and which will be returned to *bona-fide* tenderers who have not withdrawn their offers after the tenders have been adjudicated upon.

Further copies may be obtained if required on payment of 5s. each, which sum will not be returned.

The Contractor will be required to enter into a Contract in the form of that attached to the Specification Conditions and Form of Tender.

In the case of all workmen to be employed by the Contractor, the Contractor will be required to pay wages at rates not less, and to observe hours of labour not more, than those recognised by the Trade Unions and in practice obtained in the district where the work is carried out.

The Council do not bind themselves to accept the lowest or any Tender.

NORMAN SCORGIE,
Deputy Town Clerk.

Town Hall, Hackney.
June, 1914. 5411

BLACKROCK URBAN COUNCIL.

Electric Lighting.

TENDERS FOR MAINS, &c.

THE COUNCIL invite Tenders for the supply, delivery, and erection of the necessary material for the Mains system, including:—

Underground Mains.
Overhead Mains.
Feeder Pillars.
Public Lighting.

Specifications, General Conditions, and Forms of Tender may be obtained on application to the Consulting Engineer, Mr. J. P. Tierney, M.Inst.E.E., 15, College Green, Dublin, on payment as a deposit of the sum of One Guinea, which will be returned on receipt of a *bona-fide* Tender.

Tenders, sealed and endorsed "Tenders for Mains," to be addressed to the Chairman, Blackrock Urban District Council, Town Hall, Blackrock, Co. Dublin, and delivered at my office not later than 5 o'clock p.m. on MONDAY, JULY 13th, 1914.

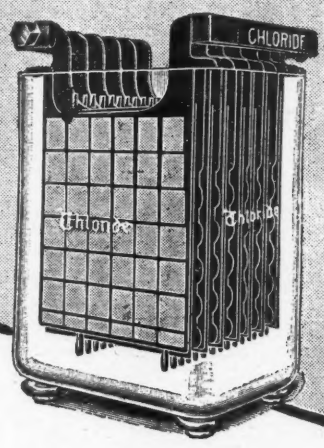
The Council do not bind themselves to accept the lowest or any Tender.

By Order,
JOHN MOONEY,
Town Clerk.

Town Hall, Blackrock, Co. Dublin.
22nd June, 1914. 5410

(Continued on page 29.)

ACCUMULATORS OF ANY SIZE FOR EVERY PURPOSE



THE Chloride ELECTRICAL STORAGE CO LIMITED

Head Office & Works:
Clifton Junction,
MANCHESTER.

London Office: **39, VICTORIA ST., S.W.**

OFFICIAL NOTICES.—*Continued from page 27.*

COMMONWEALTH OF AUSTRALIA.

Postmaster-General's Department,
June 22nd, 1914.

Tenders for Supply of Material.

TENDERS are invited for the supply of material as indicated below to the Postmaster-General's Department in Australia :—

Material required.	Where tenders receivable.	Date on which tenders close.
Telegraph and Telephone Material, Schedules W.A. 348, 352 & 361	Perth	22nd July, 1914.
Copper Wire and Binders, Schedules W.A. Nos. 355 & 356	Perth	5th August, 1914.
Cable, lead covered and various, Schedule W.A. No. 354 ...	Perth	12th Aug., 1914.
Electric Lamps and Fittings, Schedule W.A. No. 379 ...	Perth	19th Aug., 1914.
Instruments (Telephone, various and parts), Schedule W.A. No. 381	Perth	5th Aug., 1914.
Telegraph Accumulators and lower Board, Kalgoorlie, Schedule W.A. No. 327 ...	Perth	5th Aug., 1914.
Insulators, Schedule W.A. No. 378	Perth	12th Aug., 1914.
Switchboards, Telephone, various and parts, Schedule W.A. No. 351	Perth	19th Aug., 1914.
Wire, Galvanised-iron and Steel stranded, W.A. No. 359 ...	Perth	19th Aug., 1914.

Tender Forms, Specifications, &c., may be obtained, and Sealed patterns inspected at the Commonwealth Offices, 72, Victoria Street, London, S.W.

AGAR WYNNE,
Postmaster-General. 5441

OFFICIAL NOTICES.—*Continued.*

COUNTY BOROUGH OF WEST HAM.

EDUCATION COMMITTEE.

To Electricians and Electric Wiring Contractors.

THE Education Committee of the County Borough of West Ham invite Tenders for installing the Electric Light at the Rosetta Road School, now in course of erection.

Contractors desiring to tender are requested to make written application to MR. WILLIAM JACQUES, A.R.I.B.A., Architect to the Education Committee, 2, Fen Court, Fenchurch Street, E.C., for copy of Specification, Conditions and Form of Tender not later than Monday, July 13th, 1914. Each application must be accompanied by a deposit of £1 (One Pound), to be returned to those who send a *bona-fide* tender in the manner and at the time stipulated.

Sealed Tenders in the envelope supplied must be delivered by Registered Post at the Education Department, 95, The Grove, Stratford, not later than 6 p.m. on MONDAY, JULY 20th, 1914.

The Committee will not be bound to accept the lowest or any Tender.

The Contractor whose tender is accepted, and with whom a contract is entered into, will be required to enter into a bond, with sureties, for the due and satisfactory performance of the Contract, and to pay to the whole of his workmen such rate of wages and observe such hours of labour as are recognised by the Workmen's Trades Unions and in force at the time of signing the Contract. In the event of any breach of such agreement the Council will enforce the penalty clause in its entirety.

H. W. GREAVES,
Town Clerk.

Education Department,
95, The Grove, Stratford, E.
June 22nd, 1914. 5442

F. WIGGINS & SONS.

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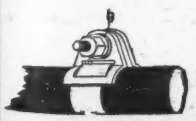

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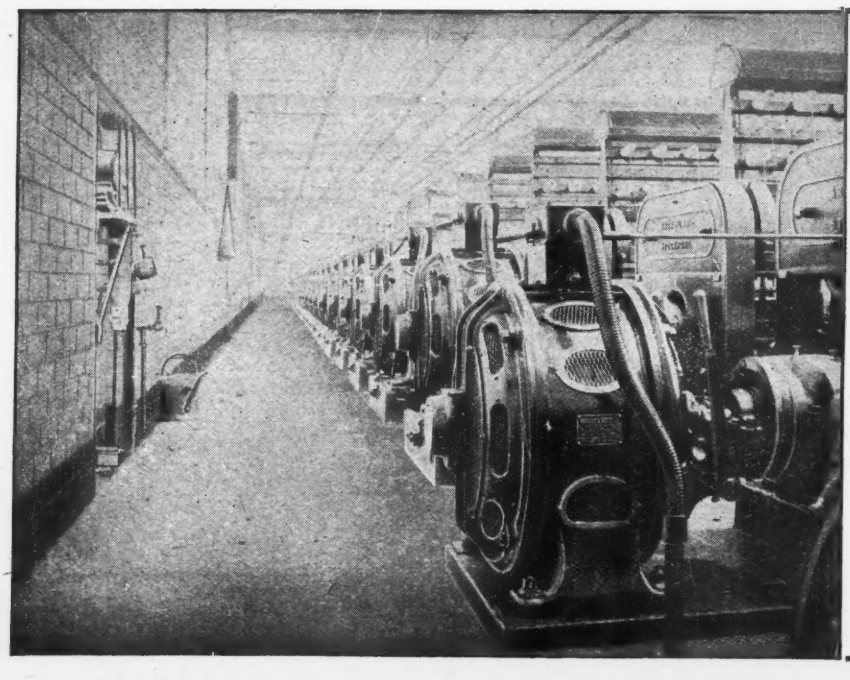

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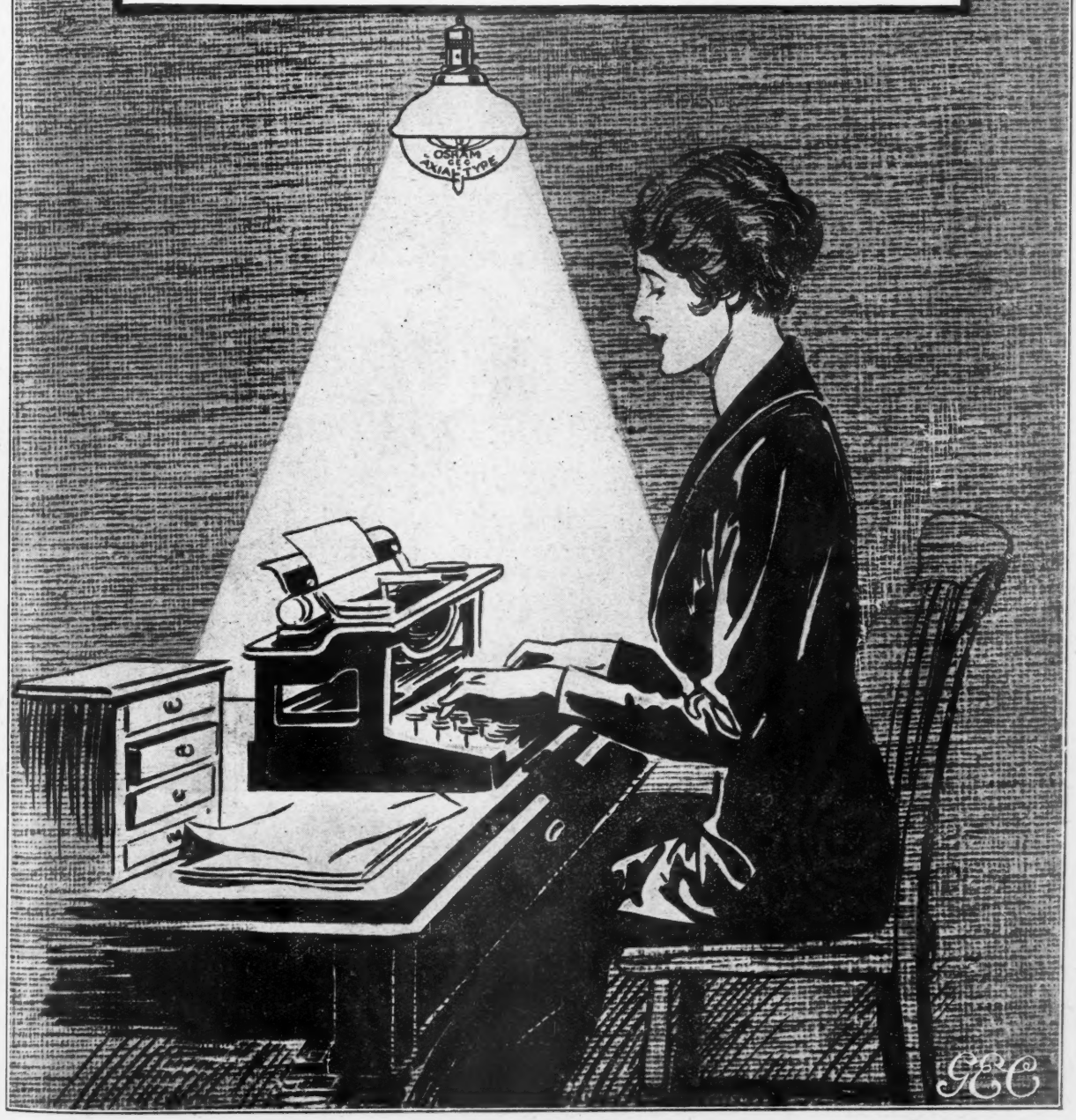

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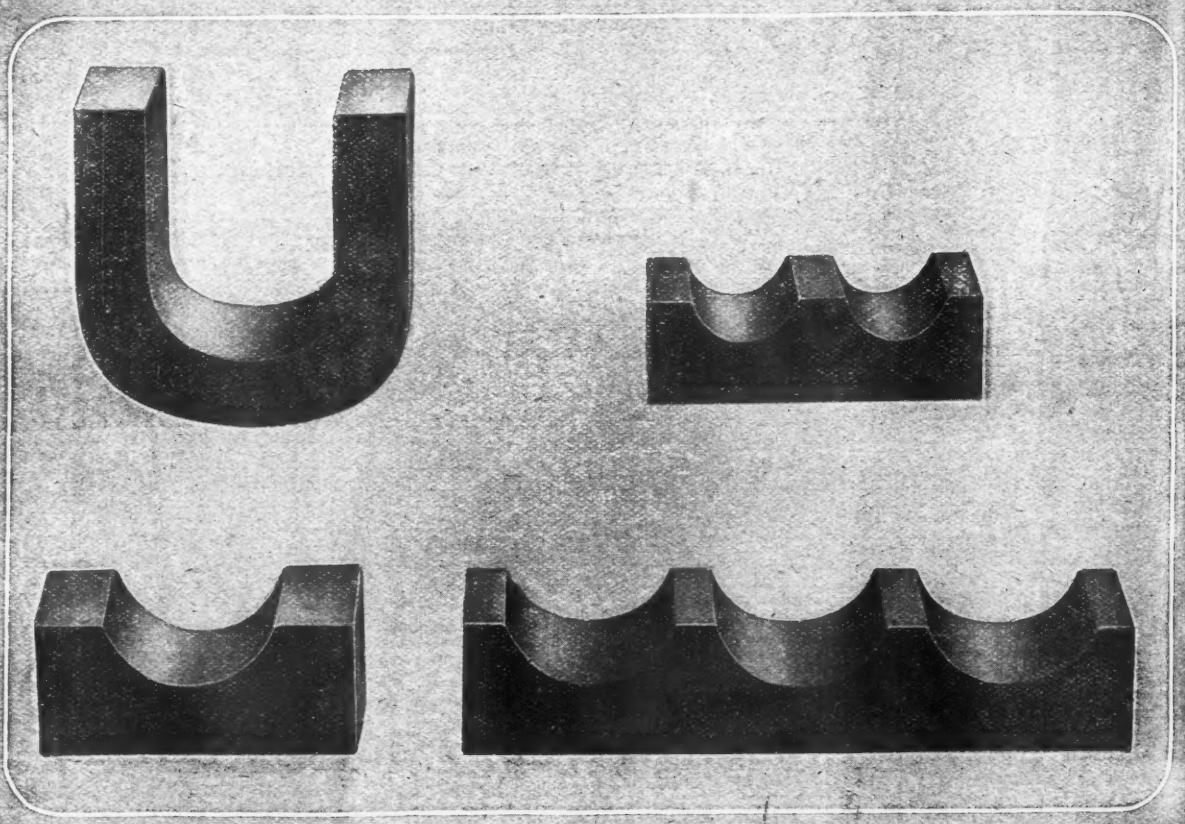

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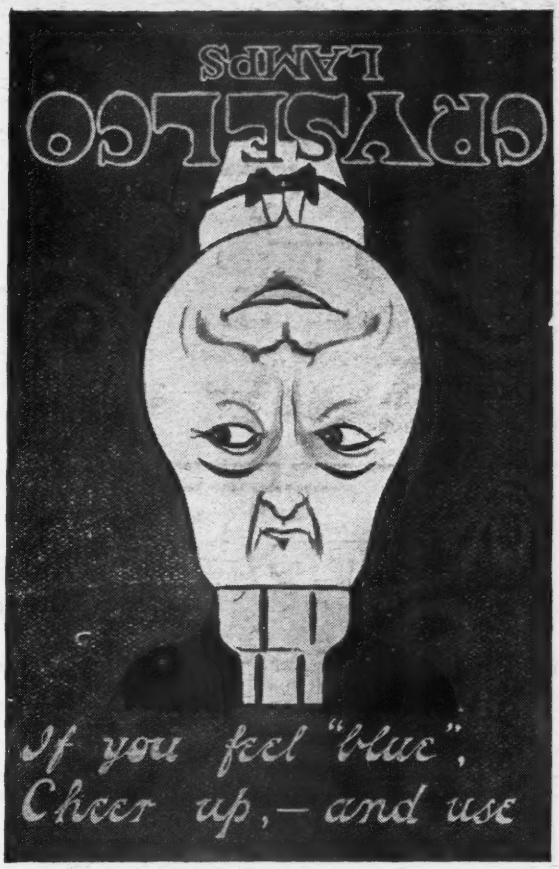

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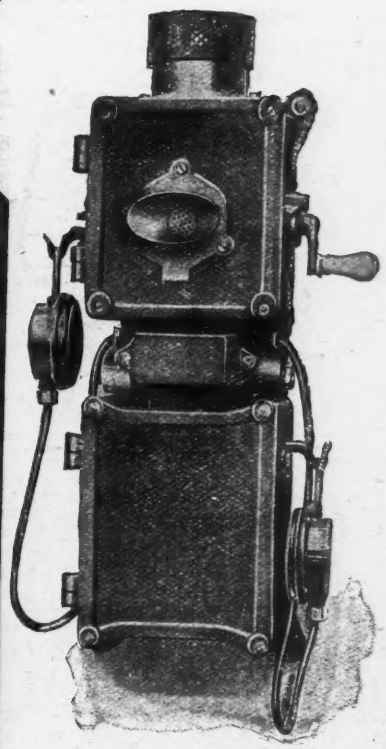

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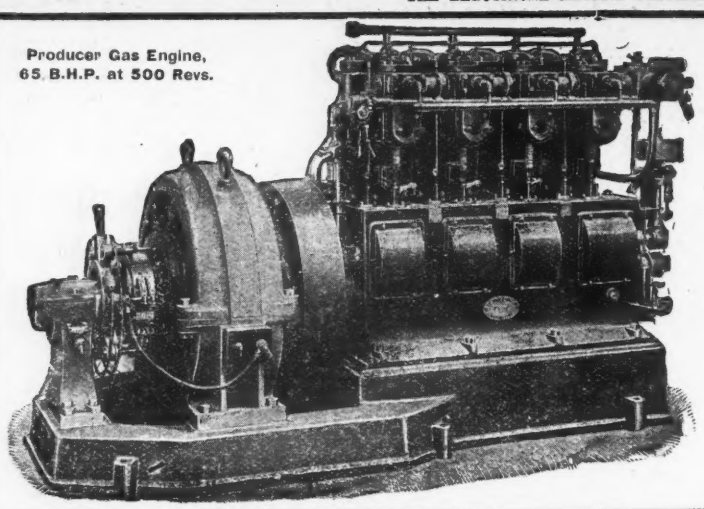

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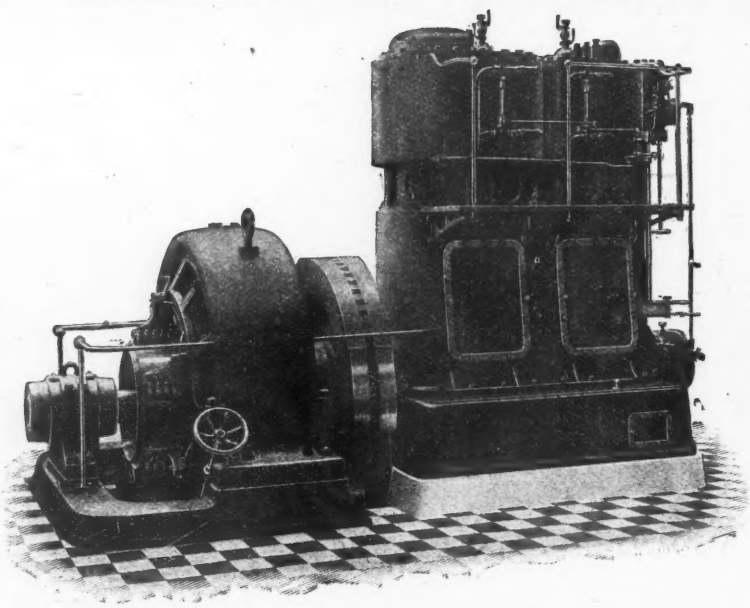

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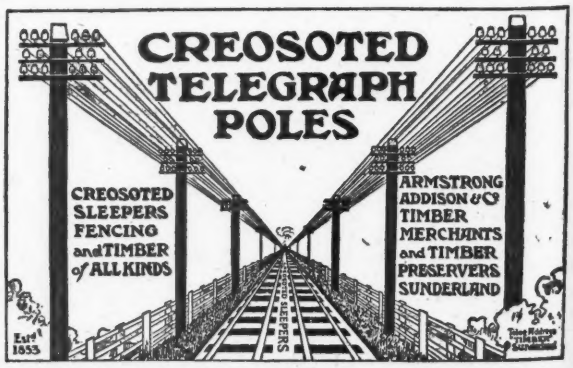
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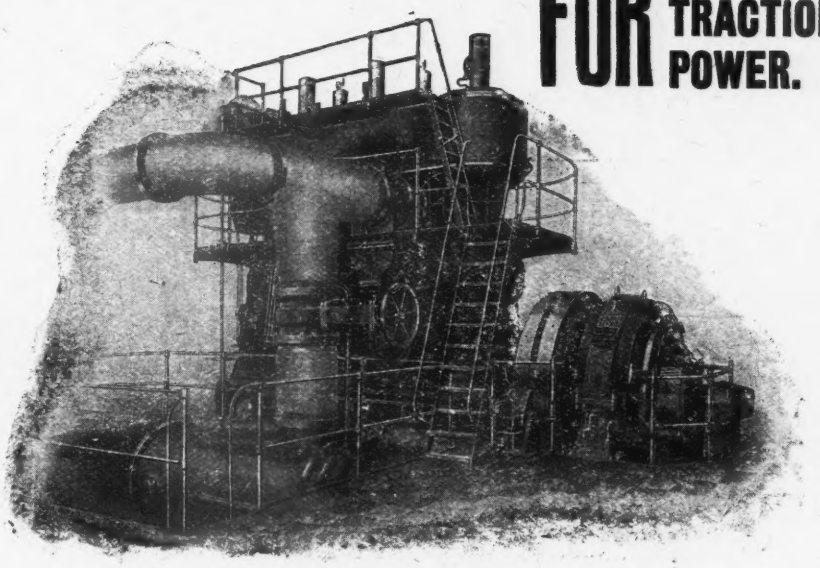

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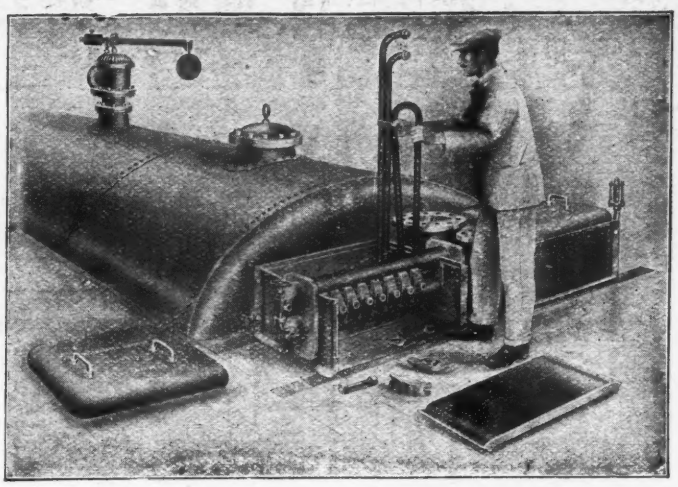

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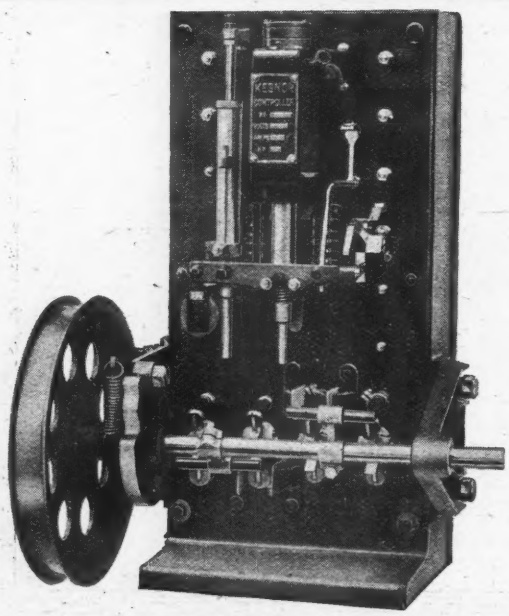

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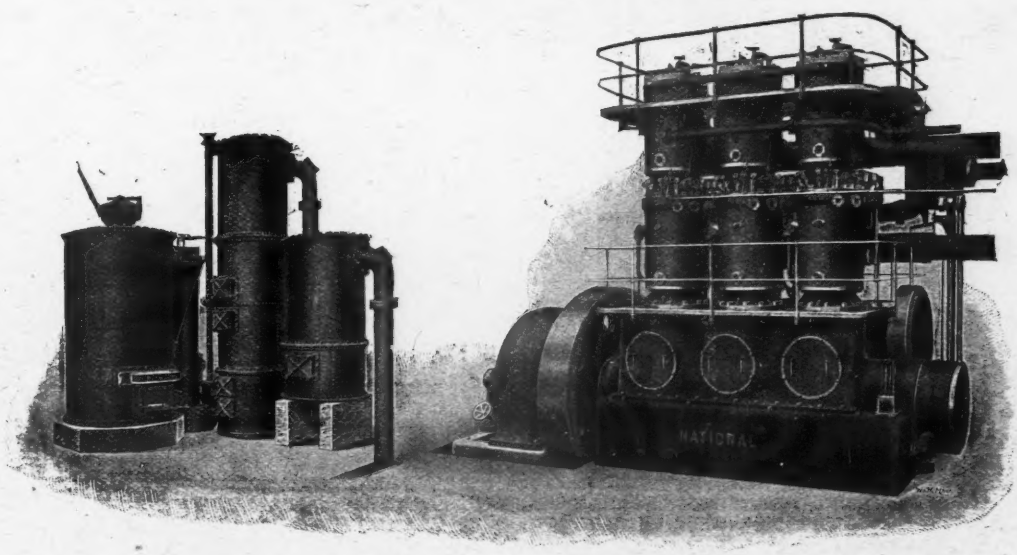

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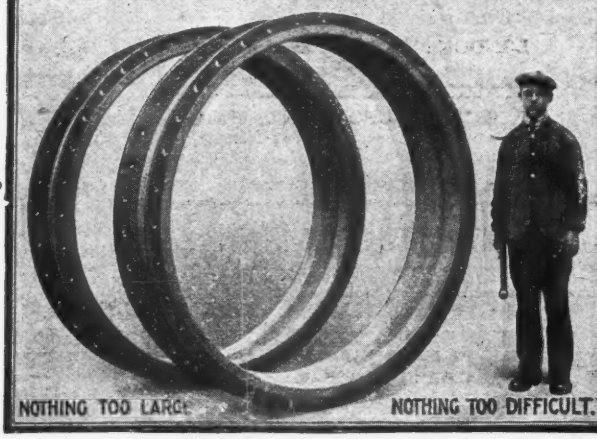

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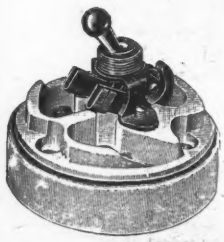

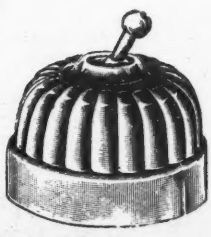

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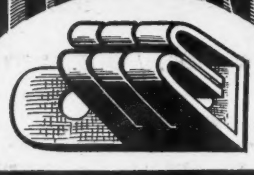

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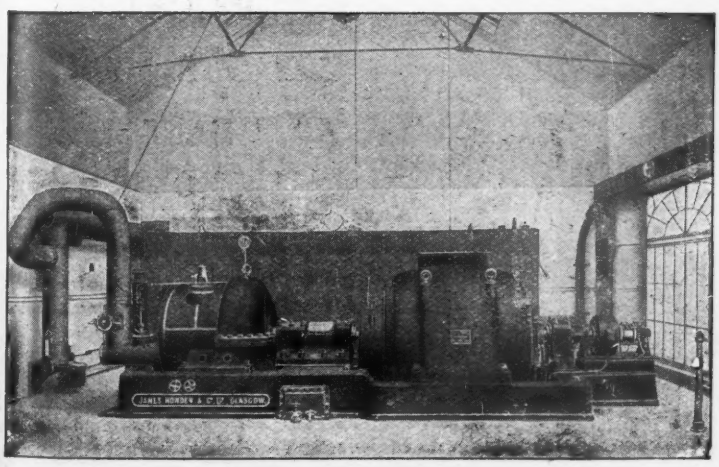

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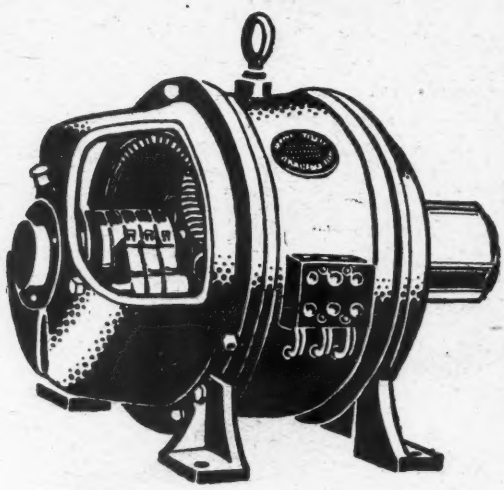

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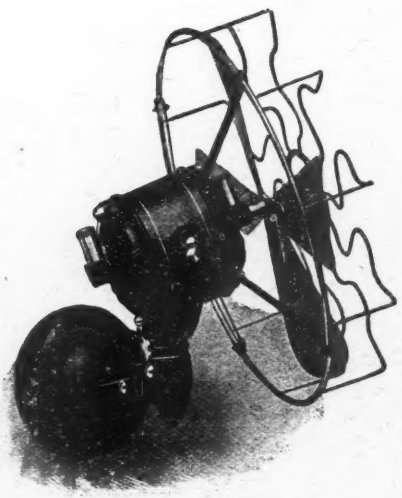

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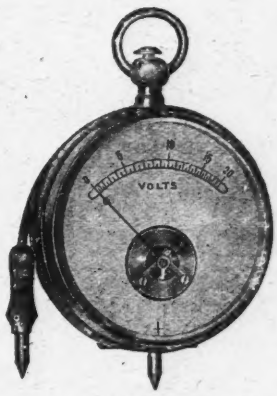

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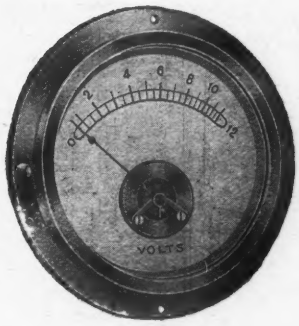

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Cheap Midget Watch Meter.
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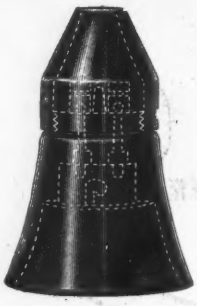

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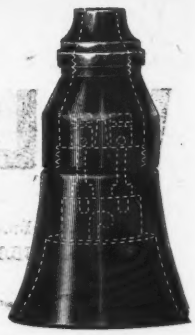

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This feature cannot be claimed by any other make on the market.

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If you want the very best in metal-cored Flame Carbons, buy Conradty's 'Noris-Excello.'

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Every machine is guaranteed and particularly suitable for charging Electric Vehicles.

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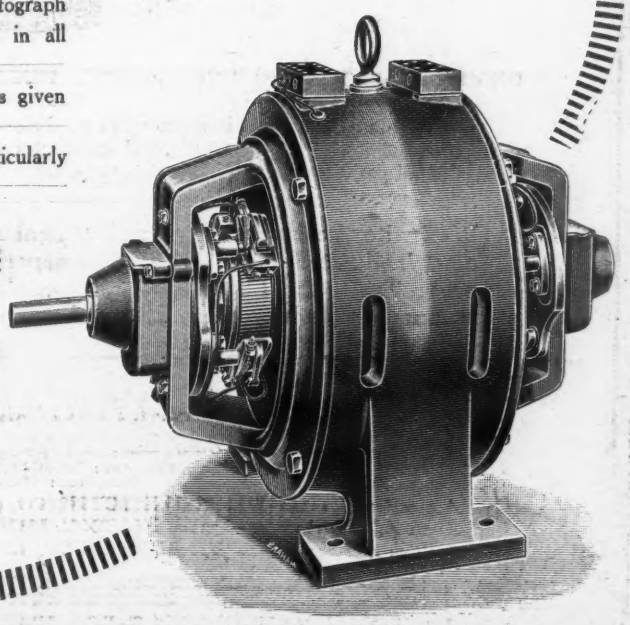

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THE Weston Synchroscope has none of the disadvantages of the ordinary rotating field Synchroscope and is in every respect unique.

It has been developed along the lines of other WESTON instruments in which every endeavour is made to reduce weight and inertia of all moving parts to the lowest limit.

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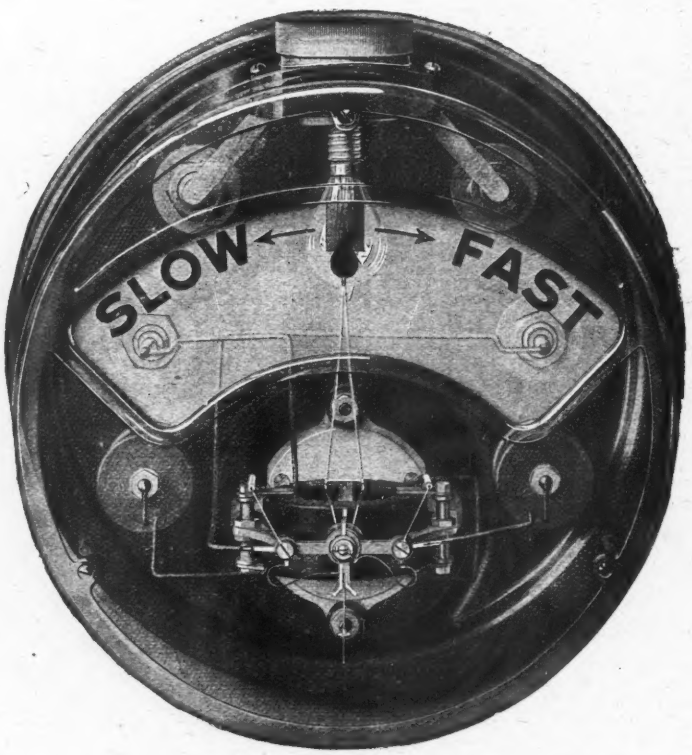
A long life and permanent accuracy is assured by reason of the superior construction, extremely light weight of the movable system, the efficiency of the damping system, and the absence of sliding contacts.



PHANTOM VIEW OF SYNCHROSCOPE, MODEL 226, SHOWING LAMP IN POSITION.

The Weston Synchroscope indicates exact synchronism within one degree of true phase coincidence over a wide range of frequency and voltage, and constitutes the simplest and at the same time most perfect solution of all problems involved in coupling alternating current machines in parallel.

We invite the most minute and critical examination of this instrument, both electrically and mechanically, in comparison with any other Synchroscope at present manufactured, and we are confident that a comparative test of the instrument will easily demonstrate the superiority of the Weston Synchroscope.

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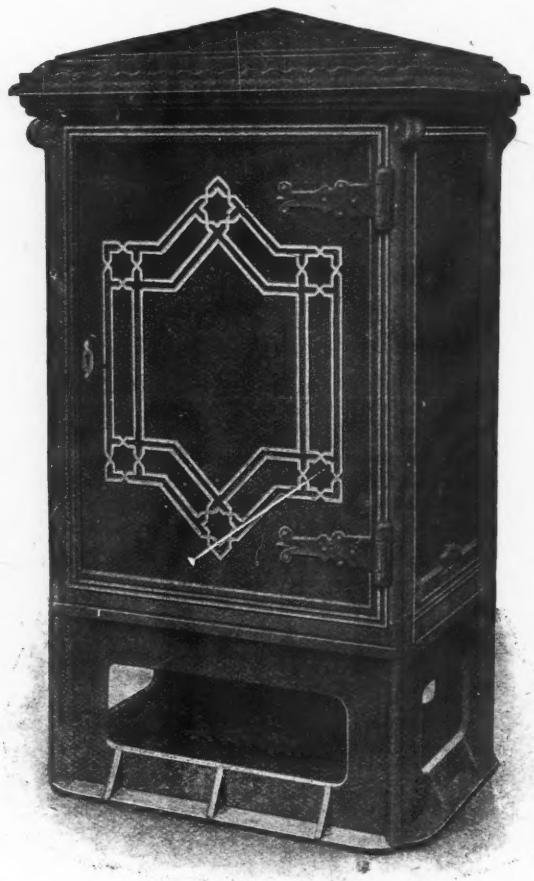
Please give us your Enquiries for odd sizes whether taller or shorter or



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with divided up interiors, &c., &c., also for doors and frames for brick chambers.

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These Pillars are of very nice appearance, are thoroughly good castings, and are very efficiently ventilated. Each Pillar is provided with two doors, hung on massive ornate malleable iron hinges pivotted on ⅝ in. dia. Brass Pins, and each door is fitted with a good Brass Lock. The first six sizes measure 4 ft. high overall above ground, the next 5 sizes, 4 ft. 3 ins. high, and size 5, 4 ft. 9 ins. high above ground. The underground part of all sizes is 1 ft. 3 ins. long.

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STANDARD SIZES:

	Inside Dimensions.	Clear Openings of Doors.
Size 1 ...	19 × 12 ins. ...	33 × 15 ins.
,, 1a ...	19 × 14 ins. ...	33 × 15 ins.
,, 1b ...	21 × 12 ins. ...	33 × 17 ins.
,, 2 ...	21 × 14 ins. ...	33 × 17 ins.
,, 2a ...	21 × 16 ins. ...	33 × 17 ins.
,, 2c ...	21 × 18 ins. ...	33 × 17 ins.
,, 2b ...	25 × 14 ins. ...	36 × 21 ins.
,, 3 ...	25 × 16 ins. ...	36 × 21 ins.
,, 3a ...	25 × 20 ins. ...	36 × 21 ins.
,, 3b ...	31 × 16 ins. ...	36 × 27 ins.
,, 4 ...	31 × 20 ins. ...	36 × 27 ins.
,, 5 ...	36 × 24 ins. ...	42 × 33 ins.
,, 6 ...	42 × 24 ins. ...	62 × 38 ins.
,, 7 ...	36 × 30 ins. ...	46 × 30 ins.
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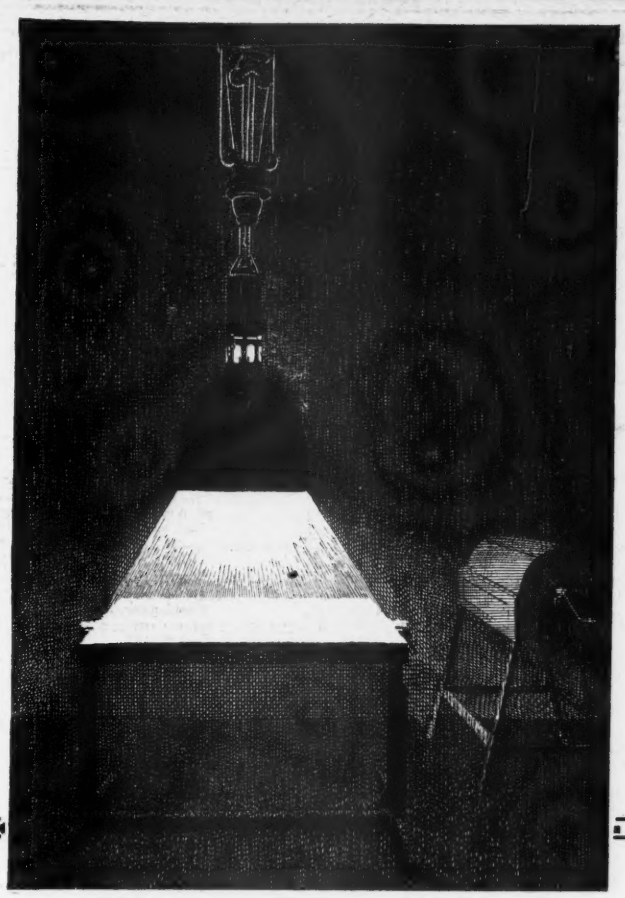

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CONTRACTORS' COLUMN.

[The following information is published in the interests of electrical contractors and others who are seeking for openings for new business. Considerable expense is incurred in the production of this column, and every care is taken to ensure that the information is new and accurate, but it will be understood that in a matter where so many correspondents are engaged, and where the amount of information to be handled is very large, this cannot always be guaranteed. If alleged inaccuracies are reported to the Editors, they will be fully investigated.]

ABERTILLERY.—Additions, girls' school; W. H. Hiley, architect, Chapel Street.

ABERYSTWYTH.—Vicarage for Holy Trinity Parish; W. T. E. Bassett, architect, North Parade.

ACREFAIR (RUABON).—Drill hall, etc., for Denbighshire T.F.A.; C. D. Rutters, architect, Parr's Bank Chambers, Wrexham.

ALLANDALE.—New P.M. Church at Sparty Lea; the Trustees.

ALTRINCHAM.—School, to replace St. John's C. of E. School; Secretary to the Education Committee. Extension of Bradbury Central Higher Elementary School; Managers.

ARBROATH.—Additions to Academy; Clerk, School Board.

ARMLEY.—Additions at workhouse, for the Bramley B. of G.; F. W. Rhodes & Sons, architects, Upper Wortley, Leeds.

ASHINGTON.—Additions, Harmonic Hall, for the Amateur Orchestral Society, Ltd.; J. Gardner, 5, Council Road.

ASHTON-ON-RIBBLE.—New Baptist Sunday School, Victoria Parade; W. T. Matley, architect, Manchester.

ASKERN (NEAR DONCASTER).—New school in Sutton Road; Clerk to the District Education Sub-Committee.

BALLATER.—New power station; Burgh Surveyor.

BALLINA.—New Town Hall; the Surveyor.

BALLYMACELLIGOTT.—Alterations to R.C. Church; Rev. T. Trant, Sacristy, St. John's, Tralee.

BALROTHERY.—Housing scheme for R.D.C.; J. Stack, Clerk.

BARROWFORD.—Additions to Church Street P.M. Chapel; Trustees.

BATH.—Drill hall for Somerset T.F.A.; A. J. Pictor, architect, Bruton.

BELFAST.—Houses, Ormeau Road; C. Macalister, architect, Whitehall Buildings, Ann Street. Alterations at Dufferin Hospital, for B. of G.; Young & Mackenzie, architects. Branch library in Park Road; City Engineer. Additions, Working Men's Instutute, Castle Street; J. Scott, architect, Ocean Buildings.

BIGGLESWADE.—Additions, Unionist Club, St. Andrew's Street; T. Cockrill, architect, Market Square.

BIRMINGHAM.—Church for Bedworth Parish; Secretary, Building Fund. New Windsor Arcade, for Wilkinson & Riddell; Watson & Johnson, architects. New premises at 99-106, Digbeth, for H. Goodman, 82, Digbeth.

BLACKBURN.—Liberal club; R. Mercer, architect, Park Lane. New schools in Witton and St. Gabriel's districts; A. H. Whipple, Director of Education.

BLAINA (MON.).—Additions, Red Lion Hotel, for Webb's, Ltd., brewers, Aberbeeg (Mon.). Housing scheme; Surveyor, Blaina and Nantylo D.C.

BLUNDELLSANDS.—Completion of Presbyterian Church Hall scheme; the Trustees.

BOLTON.—New mill, for Bolton Swan Lane Spinning Co. Additions to Prospect No. 3 Mill, for Barlow & Jones, Ltd. Alterations at the Gem Picture Palace; the Manager.

BOURNEMOUTH.—Girls' secondary school; additions to Alma Road and Winton Moordown Council Schools; F. W. Lacey, Borough Architect.

BRACKNELL (BERKS.).—Picture palace, Stanley Road, for the Wokingham Picture Palace Co.

BRADFORD.—Bakehouse and shop at Toller Lane and Whitby Road, for J. Dickinson. Alterations to warehouse in Holdsworth Street, for J. Whittingham & Sons. Picture house at Cross Lane and Ebenezer Street, Great Horton, for R. Richardson. Picture house at Birch Lane, for G. Drake. Warehouse at Valley Road, for the Bradford Corporation. Church and house in Ingleby Road, for the Rev. H. J. McMahon. Works and store at Kershaw and Raglan Streets, for H. Ingham & Sons. House at Park Drive, Heaton, for A. L. Cox. Houses and shops at New Lane, Laisterdyke, for S. Wilkinson. Branch library and baths at Tennyson Place (£6,780); City Architect. Residence at Heaton; J. Ledingham, architect, District Bank Chambers. New infirmary at Daisy Hill; W. A. Pite, architect. Housing scheme at Odsal; City Architect.

BRENTFORD.—Premises, Kew Bridge Road, for Pickford's, Ltd.; Building Dept., Pickford's, Ltd., 128, Silwood Street, Bermondsey, S.E.

BRISTOL.—Extension of premises, Temple Gate, for Mardon, Son, & Hall.

BROMSGROVE.—Tuberculosis and scarlatina ward pavilions, for the Joint Hospital Committee.

BUCKIE.—Additions to the Lyceum Picture Palace; the Manager. Picture house, East Church Street; W. Hendry, architect, 91, West Church Street.

BURY.—Extension of weaving shed, Waterside Mill, Elton; Proprietors.

CAHERCIVEEN.—New post office; Surveyor, G.P.O., Dublin.

CALDAY GRANGE (CHESHIRE).—Additions to the Grammar School; H. Beswick, County Architect, Newgate Street, Chester.

CARDIFF.—Sunday Schools, Bangor Street, for the Wesleyan Trustees; H. Budgen, architect, 96, St. Mary Street.

CARLISLE.—Extensions to Central Electric Station, for the T.C.; H. C. Marks, City Engineer, 36, Fisher Street.

CARMARTHEN.—Laundry, at the Counties' Asylum; G. Morgan & Sons, architects, 24, King Street.

CARRINGTON (NEAR NOTTINGHAM).—New church on Loscoe Mount; Rev. A. W. F. Blunt, Vicar.

CASTLEFORD.—Shops, etc., at Castle Fields; A. Hartley, architect, County Chambers.

CHALFONT ST. PETER (BUCKS.).—Additions to Cottage Hospital; R. G. Muir.

CHARD.—Re-erection of The Thatched House, Snowdon, for A. D. Paul.

CHASE TERRACE (STAFFS.).—Premises, Sankey's Corner, for Cannock Co-operative Society; H. Horton, architect, Bank Chambers, Cannock.

CHELMSFORD.—Picture and variety theatre, Moulsham Street, for Electric Theatres, Ltd., Norwich. New P.M. Church; Rev. J. W. Everingham, Minister.

CHESTER.—Sanatorium; County Architect. New P.M. Church at Pipers-ash; the Trustees.

CHESTERFIELD.—Baths, Chatsworth Road; Ald. C. P. Markham, J.P., Ringwood Hall.

CHINLEY (DERBYSHIRE).—New Church of England; Rev. W. Hodgson.

CHORLEY.—Additions to Park Road Wesleyan Church and Schools (£2,000); W. H. Dinsley, architect, 12, Cleveland Street.

CLAYTON-LE-MOORS.—New kinema in King Street; the Secretary, Empress Pictures, Ltd.

CLOWNE (DERBYSHIRE).—Stores, etc., for the Clowne Co-operative Society, Ltd., North Road.

COALVILLE (LEICESTERSHIRE).—New church at Snibston; Rev. F. W. Atkins, Vicar.

COATBRIDGE.—Technical school extension (£6,850); Clerk, Old Monkland School Board.

CORK.—Additions to the North Charitable Infirmary; A. Hill, architect.

CRAIGUENAMANAGH (KILKENNY).—School; G. P. Sheridan, 1, Suffolk Street, Dublin.

CREWE.—Alterations at West Street Mixed School; Director of Education. Extensions to works, for Pring & Son, Sandbach.

CROMPTON (NEAR OLDHAM).—Additions to the Hawk Mill; Proprietors.

DENBIGH.—Enlargement of the station, for the L. & N.-W. Railway; E. C. Trench, Chief Engineer, Euston.

DORCHESTER.—Church at Stratton; F. T. Maltby, architect, South Street.

DROYLSDEN.—Public baths and library; C. Hall, Surveyor to U.D.C.

DUBLIN.—Additions, Bewley's Oriental Café, Westmoreland Street; Miller & Symes, architects, 39, Kildare Street. Buildings, 42-43, Watling Street; J. Miles, architect, 7, Trinity Street. Warehouse, Dame Court; P. Munden, architect, Exchequer Street.

DUDLEY.—Additions to 205, High Street, for E. Grey. Premises, Castle Street and Hall Street, for W. Devis.

DUNFERMLINE.—Extension at Rumblingwell, for the Dunfermline Co-operative Society.

EARLESTOWN.—Additions, Pavilion Theatre, Market Street; the Manager.

EASINGTON (CO. DURHAM).—Alterations to "Liberalty Inn" and Station Hotel, South Hetton, for J. Nimms & Son, Ltd., Castle Eden Brewery, Castle Eden. Additions to workmen's club, New Seaham, for Vaux & Mark. Church and schools at Wheatley Hill, for the Trustees.

EASTINGTON (GLOS.).—Premises, for Cainscross and Ebley Co-operative Society, Ltd.; Manager, Cainscross, near Stroud.

EDINBURGH.—Alterations at 84, Nicholson Street, for P. Green & Co.; the Manager. Public wash-houses in Abbey Hill district; City Architect.

FISHGUARD.—Improvements to Hermon Baptist Chapel; Trustees.

FLEETWOOD.—Extensions in Dock Street, for J. Marr & Son, Ltd. Offices at Wyre Dock, for I. Spencer & Co., Ltd. Offices, etc., in Station Road and Copse Road, for the New Docks Steam Fishing Co., Ltd.

FOLESHILL.—Thirty houses at Foleshill and thirty at Bedworth, for the R.D.C.; A. E. Newey, Surveyor.

GILFACH (SOUTH WALES).—Primitive Methodist Church; Trustees.

GILLINGHAM (KENT).—New St. Augustine's Church, Rock Avenue; Mr. Templemoor, architect.

GISBURN (NEAR CLITHEROE).—Housing scheme; A. Burrow, Surveyor to Bowland R.D.C.

GLASGOW.—Additions, McLellan and Vermont Streets, for G. Milne & Co., Clutha Bakery. Offices, 301, Gt. Eastern Road, for R. & J. M'Crae, Ltd., 13, Queen Street.

GOVAN.—Additions, Washington Street, for Household Washing & Laundry Co.

GRESHAM (NEAR NORWICH).—Rectory, East Beckham Road, for F. Rawson Briggs.

GRIMSBY.—Additions to Council School, South Killingholme Haven; Scorer & Gamble, architects, Bank Street Chambers, Lincoln.

HALESOWEN.—Housing scheme, for W. Somers & Co., Haywood Forge.

HALIFAX.—Convenience at Salterhebble; extension of Technical College, Hopwood Lane; J. Lord, Borough Engineer.

HARROW.—Re-erection of laundry, for the Little Laundries, Ltd. (£5,000).

HASLINGDEN.—Extensions, Empire Picture Hall, for Hindle & Nevin.

HAYWARDS HEATH.—Congregational Church; G. Baines & Son, 5, Clements Inn, W.C.

HECKMONDWIKE.—Re-instatement of premises, Union Street, for T. S. Harrison & Sons (£2,000). Erection of disinfecting station for the D.C.; the Clerk.

HEREFORD.—County farm institute (£5,000); J. Wiltshire, Education Secretary.

HERNE BAY.—Premises, Grange Road and Reculver Road, for E. J. Line; J. Huxtable, architect, Station Road. Gas works, for the Gas and Electricity Co., Ltd.; Sir Corbett Woodall, architect.

HONLEY (NEAR HUDDERSFIELD).—Council, etc., offices in Eastgate (£2,500); Jos. Berry & Sons, architects, Huddersfield.

HORNCHURCH (ESSEX).—Council hall and offices, for the P.C.; the Clerk.

HULL.—Rebuilding saw mills, Sitwell Street, for W. W. North & Co., Ltd. Hospital, for the Health Committee; J. H. Hirst, City Architcet.

HYDE.—Rebuilding part of the Greencroft Mill, for E. Hibbert & Co.

ILKESTON.—Cinema in Bath Street, for the King's Picture House Co.

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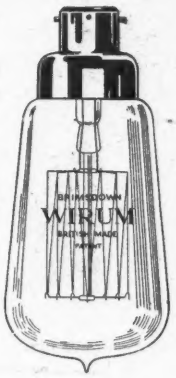

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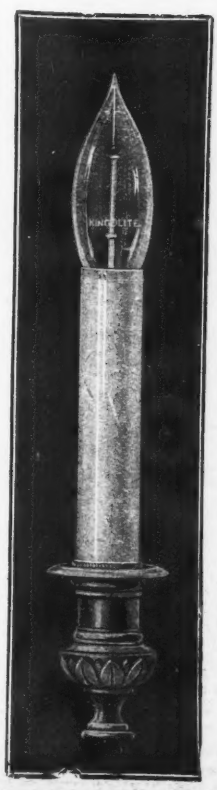

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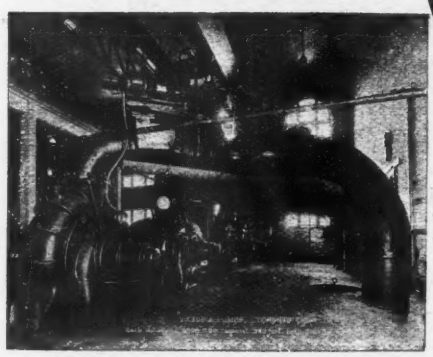

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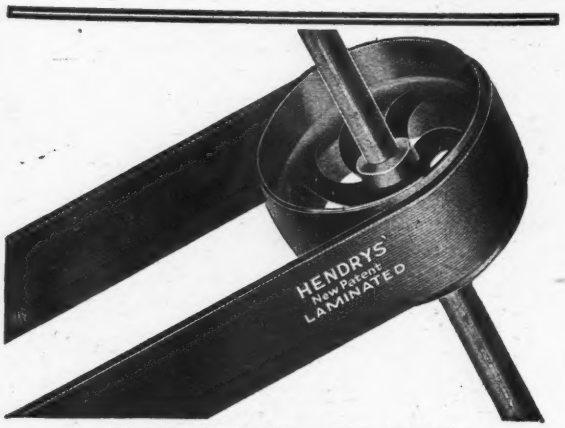

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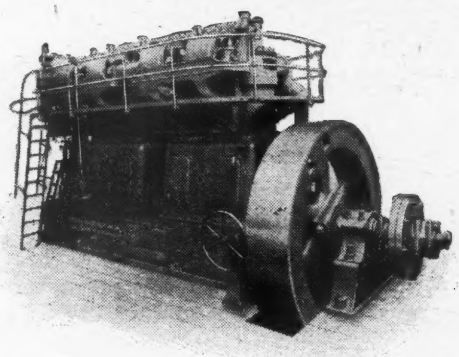

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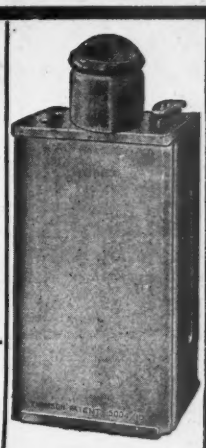
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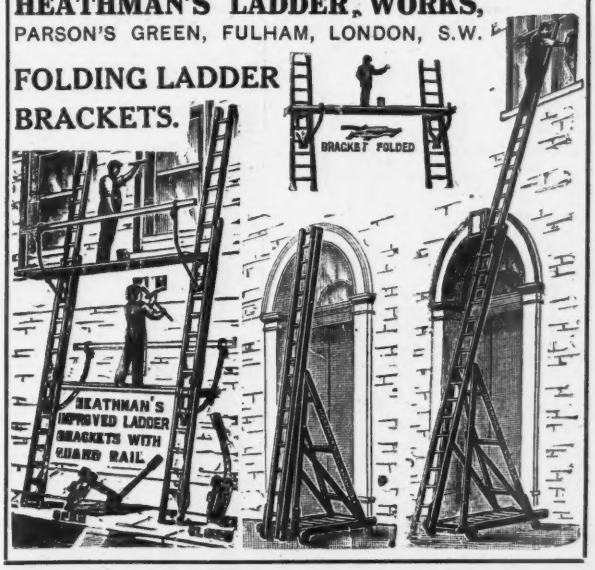

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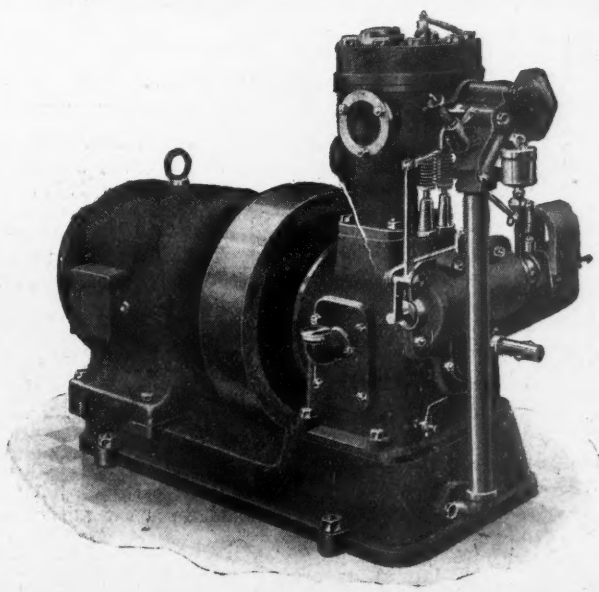

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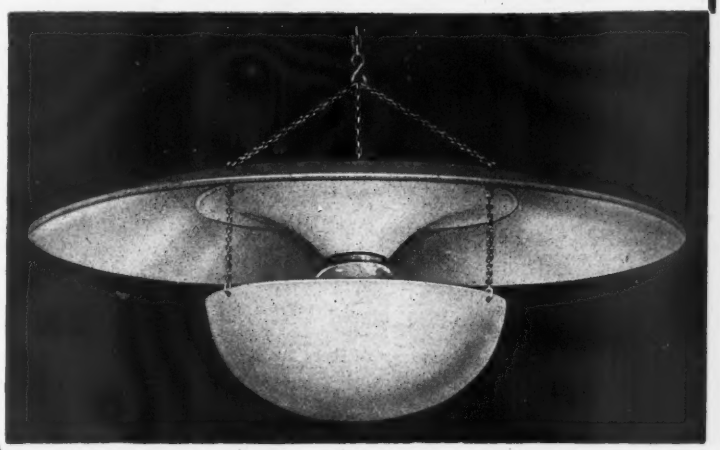

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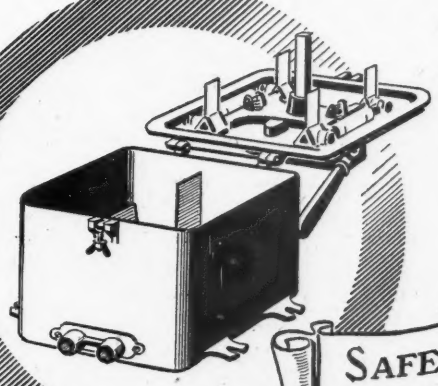

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Continued on page xxxii.

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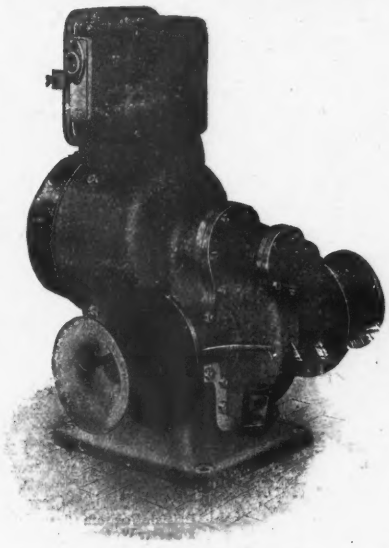

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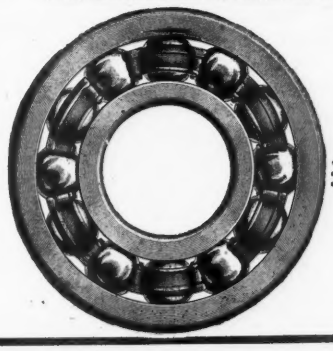

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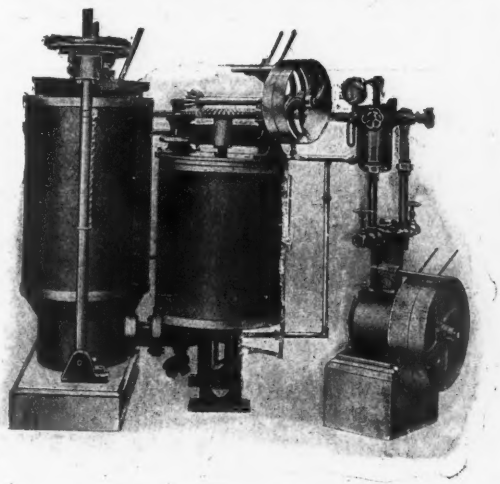

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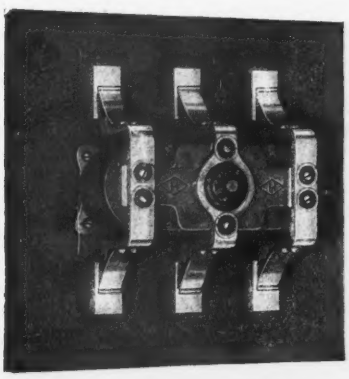

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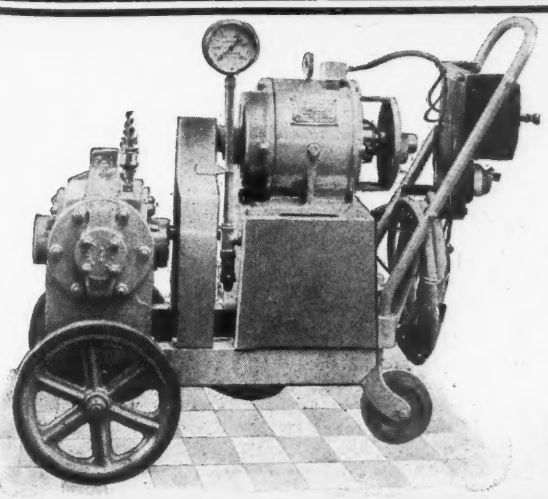

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Depth of Cable Hole	¼"	⅜"	½"	¾"	1½"	1½"	1½"	2"	2½"	2½"
Diameter of Largest Part of Body ...	⅝"	⅞"	1⅛"	1⅜"	1⅝"	2"	2½"	2½"	3"	3½"
Length over all	1⅜"	1½"	2⅛"	2⅝"	4⅛"	4½"	6¼"	6¾"	8¼"	9¾"

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DIAMETER OF LARGEST PART OF BODY ...	4"	4"	4"	4"	4"	4"	4"	4"	4"	4"	4"	4"	4"	4"	4"	4"	4"	4"	4"	4"	4"	4"	4"
LENGTH OVER ALL	1 3/8"	1"	1"	2"	3"	4"	4 1/2"	4"	5"	6"	6"	8"	8"	8"	8"	8"	8"	8"	8"	8"	8"	8"	8"

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